



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

STANFORD UNIVERSITY LIBRARIES

Y4. M59/2: A:7/pt. 1-2

AIRCRAFT PRODUCTION

HEARINGS

BEFORE THE

SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS UNITED STATES SENATE

SIXTY-FIFTH CONGRESS

SECOND SESSION

VOL. I



WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

COMMITTEE ON MILITARY AFFAIRS.

GEORGE E. CHAMBERLAIN, of Oregon, *Chairman*.

GILBERT M. HITCHCOCK, of Nebraska.

DUNCAN U. FLETCHER, of Florida.

HENRY L. MYERS, of Montana.

CHARLES S. THOMAS, of Colorado.

MORRIS SHEPPARD, of Texas.

J. C. W. BECKHAM, of Kentucky.

WILLIAM F. KIRBY, of Arkansas.

JAMES A. REED, of Missouri.

KENNETH D. MCKELLAR, of Tennessee.

HOKE SMITH, of Georgia.

FRANCIS E. WARREN, of Wyoming.

JOHN W. WEEKS, of Massachusetts.

JAMES W. WADSWORTH, Jr., of New York.

HOWARD SUTHERLAND, of West Virginia.

HARRY S. NEW, of Indiana.

JOSEPH S. FRELINGHUYSEN, of New Jersey.

HIRAM W. JOHNSON, of California.

PHILANDER C. KNOX, of Pennsylvania.

CARALYN B. SHELTON, *Clerk*.

SHELDON S. JONES, *Assistant Clerk*.

S. W. MCINTOSH, *Assistant Clerk*.

SUBCOMMITTEE.

CHARLES S. THOMAS, *Chairman*.

JAMES A. REED.

HOKE SMITH.

HARRY S. NEW.

JOSEPH S. FRELINGHUYSEN.

CONTENTS.

	Page.
Acosta, Mr., answers to questions of Senator Reed by-----	602
Adams, Frank U., New York Times, New York City, statement of-----	485
Anderson, J. H., Wright-Martin Aircraft Corporation, New Brunswick, N. J., statement of-----	301
Belloni, Lieut. Leopoldo, Italian Military Aviation Section, statement of--	448
Bennett, W. F., treasurer Lewis-Vought Corporation, Long Island City, N. Y., statement of-----	419
Breese, Sidney, Breese Aircraft Corporation, statement of-----	438
Brown, Maj. H. S., Bureau of Aircraft Production, statement of-----	491
Brown, Maj. Roy S., Aviation Section, statement of-----	391
Collins, R. H., president and general manager of the Cadillac Motor Car Co., statement of-----	222
D'Annunzio, Capt. Ugo, Italian Army Aviation Section, statement of----	405
Davis, John H., statement of-----	547
Day, ———, Standard Aircraft Corporation, statement of-----	349
Depew, Richard Henry, jr., statement of-----	535
Douglas, James S., president United Verde Extension Mining Co., Jerome, Ariz., statement of-----	609
Downey, Maj. A. C., Bureau of Aircraft Production, statement of-----	469, 487, 505
Edgar, Col. C. G., Aviation Section Signal Corps, statement of-----	3
Finklestein, ———, Standard Aircraft Corporation, statement of-----	341
Fisher, Charles, Fisher Body Corporation, statement of-----	243
Ford, Henry, Ford Motor Car Co., statement of-----	212
Gilkeson, Maj. Adlai H., statement of-----	596
Gillett, M., Wright-Martin Aircraft Corporation, statement of-----	303
Guy, B. A., secretary Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., statement of-----	63
Hand, William, assistant to the sales manager, Wright-Martin Aircraft Corporation, statement of-----	304
Hendrickson, Carl, Excelsior Motor Manufacturing & Supply Co., state- ment of-----	441
Hibben, John Grier, president of United States School of Military Aero- nautics, Princeton, N. J., statement of-----	297
Hills, H. H., Packard Motor Car Co., statement of-----	162
Houston, George H., manager Wright-Martin Aircraft Corporation, state- ment of-----	313
Huff, Thomas Henri, Standard Aircraft Corporation, statement of-----	332
Hunsaker, Naval Constructor J. C., statement of-----	
Hunt, O. E., chief engineer Packard Motor Car Co., statement of-----	162
Jandron, Francis Lyster, assistant secretary of Packard Motor Car Co., Detroit, Mich., statement of-----	161
Jones, Lieut. Col. E. Lester, Aviation Section Signal Corps, statement of--	57
Keetering, C. F., Dayton Wright Airplane Co., statement of-----	257
Kepperly, James E., vice president Curtiss Aeroplane & Motor Cor- poration, statement of-----	117, 156
Lee, John R., secretary to Mr. Henry Ford, statement of-----	212
Leland, W. C., Lincoln Motor Car Co., statement of-----	229
Locker, J. E., statement of-----	197
Manly, Charles M., Curtiss Aeroplane & Motor Corporation, statement of--	150
Masters, Standard Aircraft Corporation, statement of-----	329
Mayo, W. D., Ford Motor Car Co., statement of-----	211
Mendelsbom Fisher Body Corporation, Detroit, Mich., statement of-----	253
Mingle, Harry B., president Standard Aircraft Corporation, statement of--	339
Morgan, William A., production manager Curtiss Aeroplane & Motor Corporation, statement of-----	86, 107

	Page.
Morrison, George A., production manager Breese Aircraft Co., statement of -----	425
Mueller, George H., chief engineer Curtiss Aeroplane & Motor Corporation, statement of -----	122
Muhlenberg, Maj. H. C. K., Signal Corps, answers to questions of Senator Reed -----	586
Parish, William F., chief of oil and lubrication branch, supply section, Bureau of Aeronautics, statement of -----	563
Perrette, Leo. J., Army Inspector, Industrial Aircraft Board, statement of -----	629
Randall, L. G., Standard Aircraft Corporation, statement of -----	325
Report of board of officers conducting tests on De Haviland 4 and Bristol fighter airplanes -----	590
Rice, Maj. Cushman A., Air Service, statement of -----	613, 637
Rider, W. K., production engineering department, Signal Corps, statement of -----	422
Rose, Maj. Charles B., Signal Corps, statement of -----	529
Simpson-Fisher Body Corporation, Detroit, Mich., statement of -----	251
Smith, Maj. Frank E., Signal Corps, statement of -----	507
Statement of Senator New concerning the production of Liberty motors at the Nordyke & Marmon plant at Indianapolis, Ind. -----	295
Tabutau, Lieut., answers to questions of Senator Reed -----	596
Talbott, H. E., Dayton Wright Airplane Co., statement of -----	268
Testoni, Second Lieut. Felice, technical department of aviation experimental engine section, statement of -----	443
Tibbetts, Packard Motor Car Co., statement of -----	205
Weber, C., production manager Curtiss Aeroplane & Motor Corporation, statement of -----	146
Wilborn, Maj. Arthur E., Signal Corps, answers to questions of Senator Reed -----	588
Williams-Lincoln Motor Car Co., statement of -----	240
Wintringer, Princeton University, Princeton, N. J., statement of -----	297
Woodhouse, Henry, Aero Club of America, statement of -----	651
Workman, W. H., Lafayette Hotel, Washington, D. C., statement of -----	451

AIRCRAFT PRODUCTION.

WEDNESDAY, MAY 29, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to call, in the committee room, Capitol, at 10 o'clock a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Smith of Georgia, and Frelinghuysen.

Also present: Col. C. G. Edgar and Lieut. Col. E. Lester Jones, of the Aviation Section, Signal Corps.

The CHAIRMAN. We will first hear from Col. Edgar. Colonel, will you please state your official position?

STATEMENT OF COL. C. G. EDGAR.

Col. EDGAR. I am a colonel, Signal Corps, United States Army.

The CHAIRMAN. And charged with what?

Col. EDGAR. I was charged with the construction division; that has since been merged into what is called the supply division of the Signal Corps.

The CHAIRMAN. Have you in charge now both or either?

Col. EDGAR. The supply division includes the old construction division.

The CHAIRMAN. That has been transferred?

Col. EDGAR. Yes, sir; except that last fall, starting, I think, along in November, the quartermaster came in charge of the construction division of the War Department and the Secretary of War directed that construction work was to be done under his direction. We made some complaint against this, because I had organized a building organization, had it in complete shape, and we were finally permitted to go ahead and finish the work we had started.

Senator SMITH of Georgia. What was your business before you came into the Army?

Col. EDGAR. I was graduated from Cornell University as a chemical engineer; I was assistant superintendent of the Detroit gas works; then entered the business that my father and grandfather were in before—W. H. Edgar & Son, the distribution and manufacture of sugar.

Senator SMITH of Georgia. When did you come into the Army?

Col. EDGAR. I came into the Army—I was commissioned reserve captain in the Quartermaster Corps a year ago last December; I was called to duty with the Signal Corps in April of last year

Senator SMITH of Georgia. And you have been on duty ever since?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. You looked especially first after the selection and construction of the flying fields, did you not?

Col. EDGAR. Senator, when I first came down here, there did not seem to be a very clear idea of just what was necessary.

Senator SMITH of Georgia. That was when?

Col. EDGAR. At the start, and I was sent to Canada to find out what was done at Camp Borden, and I came back with a report to Gen. Squier and Gen. Foulois; then I was put in charge of construction of what was to be 24 flying fields.

Senator SMITH of Georgia. That was when?

Col. EDGAR. That was April of last year. On the 21st day of May, last year, Gen. Squier organized a construction division and put me in command of it. That really started my work.

Senator REED. And you organized that?

Col. EDGAR. I organized that.

Senator REED. And you say you had a completed organization?

Col. EDGAR. Yes, sir.

Senator REED. By what time, approximately?

Col. EDGAR. Of course, as an institution is built it usually improves, if you are working hard on it. I did construction work all the time I was organizing, started three fields in May, and I turned out the first one by the 4th of July, but my organization I do not consider was a complete one until along in September; the assistants and officers I brought in, I had to transfer out and to bring in new talent and work it around, until in September I think my organization was complete.

Senator REED. When was it this work was taken out of your hands?

Col. EDGAR. The new work was taken out of my hands in, I believe, November. I can look up the date for you. I do not have it in mind exactly.

Senator REED. In what way was that done?

Col. EDGAR. It was taken out by order of the Secretary of War concentrating all the construction work of the Army in the hands of the construction division of the Quartermaster Corps.

Senator REED. You started in then in the month of April to locate the various flying fields?

Col. EDGAR. Yes, sir.

Senator REED. That is one thing. What else did you have to do besides that?

Col. EDGAR. We were to locate the fields; we were to rent them; we were to prepare plans and specifications for a project that had never been contemplated in the War Department or in the United States before.

Senator REED. What project was that?

Col. EDGAR. The project of building an aviation field. Then we were to buy materials, employ contractors, and put up these buildings.

Senator REED. The buildings necessary on the aviation fields?

Col. EDGAR. Yes, sir.

Senator REED. In a general way, what did they consist of?

Col. EDGAR. They consisted of a series of hangars, machine shops, schoolhouse, administration building, garage, one or two aero-repair buildings, barracks for troops, barracks for cadets, officers' mess hall, officers' quarters, commanding officer's house, guardhouse, bakery, quartermaster's stores, aero stores—54 buildings altogether, I believe—now constitute an aviation training plant, a unit camp.

The CHAIRMAN. How many camps existed when you were called into that branch?

Col. EDGAR. When I was called into the service there was a camp at San Diego, on North Island.

The CHAIRMAN. Was that the only one?

Col. EDGAR. No, sir; Camp Kelly, at San Antonio, Tex. There was a hydroplane camp belonging to the Government at Essington, Pa., and there was a camp at Mineola, Long Island. None of these were built with the particular idea of training aviators. They were fields that had been rented or presented to the Government. For instance, Essington was a quarantine station, a lot of brick buildings 100 years old; Mineola had been an exposition grounds.

The CHAIRMAN. Your work, then, required the construction of buildings on these plants already in the possession of the Government as well as new ones?

Col. EDGAR. Yes, sir; we built at Mineola and we built at Kelly and we are now building at North Island.

The CHAIRMAN. Who had the selection of the sites for these fields?

Col. EDGAR. The old sites, you mean, or the ones that came in new?

The CHAIRMAN. The new ones.

Col. EDGAR. I have a list here of how these were selected. They were selected by boards of officers. For instance, Mineola was picked out by Capt. Kilner; it had been used before by the New York Aero Militia. Mount Clements was passed on by Gen. Foulois, and I accompanied him, but I was not a member of the board.

Senator SMITH. You went at once to Canada to study the aviation matter?

Col. EDGAR. I went at once to Canada, to Camp Borden.

Senator SMITH. To study the army aviation training field?

Col. EDGAR. Yes, sir. There I found a very cold reception. I had not any particular papers and I was treated by the English officers politely, but very coldly. I persuaded Gen. Hoare, by sticking to him, to allow me to go and see the field. He said he had no authority from England, and, while we had just declared war, he did not know how to act. I went up to Camp Borden, and there found a Harvard man named Oscar Filley, who has since come into our service as a lieutenant colonel, and we talked the same language. When I came out I had his plans and specifications; he turned everything over to me that I wanted. I went back to Washington and reported to Gen. Squier and advised him that, in my opinion, he must have an architect who would get out these plans for me; that I could not undertake to organize an architect's office and get out plans and get them done quickly.

The CHAIRMAN. That suggestion was adopted, was it?

Col. EDGAR. That suggestion was adopted. I went to Detroit and hired Mr. Kahn; I took his office, cleared out every bit of work he had in it, took his entire force, and we got out the plans for 54 buildings in about 10 days.

The CHAIRMAN. That was in what month?

Col. EDGAR. That was in May.

Senator FRELINGHUYSEN. Fifty-four camps or 54 buildings?

Col. EDGAR. Fifty-four buildings.

The CHAIRMAN. Has the plan then devised been pretty generally followed?

Col. EDGAR. It has been followed all the way through. We have made a few changes where we could save money. Of course, our first plans were very hurried, and I found we could save in timber and in time, and could save here and there in the use of buildings, and the amount of air space necessary, etc.

Senator FRELINGHUYSEN. In other words, the arrangement is standardized and uniform?

Col. EDGAR. Yes, sir; we standardized the buildings and standardized the arrangement of the camps.

Senator REED. Let me ask you this question before you proceed: What were your business connections before you went into this Army work?

Col. EDGAR. Senator, my business had been rather general. My father left an estate in the sugar business, and I had been the managing partner of W. H. Edgar & Son, distributing sugar, and president of the Continental Sugar Co., with three beet-sugar plants in Ohio. I was interested in navy beans; I am president of a company that distributes, I think, quite the largest amount of white beans and colored beans in the United States; I am director and secretary of the First National Bank of Detroit, and I have had charge——

Senator REED. I did not mean really to inquire into your private business except to this extent. Have you been engaged in any way with the manufacture of those supplies that would enter into the aviation field work, that you were undertaking?

Col. EDGAR. No, sir.

Senator REED. And you have not, of course, had anything whatever to do with, any connection with any factor or anything of that sort, that has been put in in any of these buildings?

Col. EDGAR. No, sir; I would like to tell you——

Senator REED. You have not had to do with the sale of any of the lands, have you?

Col. EDGAR. No, sir.

Senator REED. I ask these questions more as a matter of protection to you than anything else.

Col. EDGAR. I would be very glad to have in the record that I was chairman of the First National Bank's committee which made loans to the automobile companies, and as the chairman of that committee I was very scrupulous in not holding any automobile investments of any sort or description.

Senator FRELINGHUYSEN. In other words, you financed the automobile companies doing business with the Aircraft Production Board?

Col. EDGAR. The First National Bank made loans to them before the war from their inception. For example, the Packard Co. has an account at the bank; the Hupp Co., and, I think, the Hudson and some others, and in my connection with the bank I was chairman of the committee that passed on and inspected those loans.

The CHAIRMAN. Can you tell at what time those loans were made?

Col. EDGAR. Oh, those loans were made up to, I guess, the time I came into the service. The companies are now in pretty good shape financially, but they started as pretty weak investments.

The CHAIRMAN. When did that begin?

Col. EDGAR. In 1903 or 1904, when the first automobile companies started in Detroit.

The CHAIRMAN. You have had nothing to do with the purchasing of any of those things that the automobile companies furnished?

Col. EDGAR. No, sir.

Senator REED. In your capacity here?

Col. EDGAR. No, sir; I have had nothing to do with purchasing of this sort, nor have I had any connection with automobile companies of any sort.

Senator FRELINGHUYSEN. Have you a standardized plan of the aviation fields that you can file in connection with the record?

Col. EDGAR. I have.

Senator SMITH. Let me ask you to state once more how you were educated?

Col. EDGAR. I am a graduate of the Michigan Military Academy and a graduate of Cornell University.

Senator SMITH. You took an engineer's course?

Col. EDGAR. I took a chemical engineer's course at Cornell, and I also had a military education in the State Military Academy.

Senator REED. I suggest that we take one of these plans, as we might wish to have it with us for reference.

Col. EDGAR. I shall be very glad to file such a plan. I thought I had one here.

The CHAIRMAN. We should like to have you furnish one between now and Saturday night.

Senator SMITH. How many completed fields have you?

Col. EDGAR. Senator, I have not the number in my mind; I think it is 27, but I will put it in the record, if you will permit me.

Senator FRELINGHUYSEN. Are they all complete?

Col. EDGAR. No, sir; we are building at Riverside, Cal., at Sacramento, Cal.; we are nearly completed at Americus, Ga., and the West Point job at Mississippi is nearly done. We had four under way; besides that we are building aero repair plants.

Senator FRELINGHUYSEN. Have you had anything to do with the Navy aviation fields?

Col. EDGAR. No, sir.

Senator FRELINGHUYSEN. They built their own?

Col. EDGAR. They have built their own. We have collaborated with them; we have exchanged plans and ideas.

Senator FRELINGHUYSEN. But no cooperation?

Col. EDGAR. We have actually done no work for them. We have just cooperated.

Senator SMITH of Georgia. What grade is necessary on your fields? I just mention that. What is the limit?

Col. EDGAR. It depends, Senator, upon a great deal what the field is to be used for. In the elementary training field we have been trying not to take fields that were over 2 per cent grade—that is, 2 feet in the 100—but on advanced training fields, gunnery schools, and that

sort of thing, a very small platted space will do if the surroundings are all right. We are in the midst of putting in a field at Miami just now that is going to be pretty rough, but it is for gunnery.

Senator FRELINGHUYSEN. Is that a standard field?

Col. EDGAR. A half standard field.

Senator FRELINGHUYSEN. How many aeroplanes will that accommodate?

Col. EDGAR. Fifty, with 10 hangars, 5 planes to the hangar.

Senator FRELINGHUYSEN. Are those combat or training planes?

Col. EDGAR. All combat.

Senator FRELINGHUYSEN. How many will they accommodate?

Col. EDGAR. I should say they will take four or five; you could hardly get six in one of them.

Senator FRELINGHUYSEN. In order that the committee may understand the organization, how many men are there in the aeroplane service?

Col. EDGAR. This is rank hearsay, Senator; I have not the figures.

Senator FRELINGHUYSEN. Are you familiar with the organization?

Col. EDGAR. No, sir.

Senator FRELINGHUYSEN. Then I will withdraw the question.

Senator SMITH. How many men do you place in one of these flying fields?

Col. EDGAR. These fields were built—a field of that size is built to take care of 900 men—that is, 600 enlisted men, 300 cadets, and 72 officers; 972 in all—but the exigencies of the service have been such that they have very largely increased the number and have put tents around the barracks, and by running a good many more men on the fields some of these fields have 2,100 men that were built for only 900.

Senator FRELINGHUYSEN. The percentage of strength of cadet flyers to nonflying personnel is 33½ per cent?

Col. EDGAR. In the schools?

Senator FRELINGHUYSEN. Yes; you say 900 men.

Col. EDGAR. No, sir. When Gen. Fulois worked this out we took the English practice, and we believed 600 enlisted men could float 300 cadets in work in the school. It has been developed that it takes 750 workingmen to float 150 cadets.

Senator FRELINGHUYSEN. Then the efficiency in the American camps is less than that in the English camp; is not that so?

Col. EDGAR. Senator, I would not like to say that; but we have new, green men coming in from the draft, coming in everywhere, and England has been at war for three years. I am not at all convinced that within another year or so we may not be able to place ourselves upon the same basis they are on.

The CHAIRMAN. My understanding is it takes 13 to 14 men to a machine.

Col. EDGAR. I think that is true over the whole surface. What we are talking about here is simply a school. This is the organization of the school.

The CHAIRMAN. Colonel, please go ahead in your own way and tell us how many camps you have located.

Col. EDGAR. We started out locating these fields, as I told you. I made a history of my work here for Gen. Squier the other day; here is a copy. I located the fields at Rantoul, Dayton, Belleville—

The CHAIRMAN. All in Ohio?

Col. EDGAR. No, sir; Dayton, Ohio; Rantoul, Ill.; Belleville, Ill.; and Field No. 2, at San Antonio, Tex.

The CHAIRMAN. What is the name of that field?

Col. EDGAR. Kelly 2, it is called. Then, the next job I had to do was to build one balloon school, and we secured Fort Omaha and put up some additional buildings there and housed the balloon school. That is on Government property. The next group of fields are at Memphis, Fort Worth, Waco, Dallas, Lake Charles, Wichita Falls, and Houston. The board consisted of Col. Arnold, Col. Crabtree, and myself.

The CHAIRMAN. Why were so many fields located in the State of Texas?

Col. EDGAR. Because fall time was on us and we had to fly in the winter. They had to be located in the South. We went down there wondering whether they could be located there. We went down to find a country open where preliminary flying could be done, where we would not have stumps and trees, and where we would be pretty sure of getting flying hours in winter.

Senator REED. Where, if a man did not know how to manage his machine and he had to alight, he could alight safely at any place?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. Open land had to be free of stumps, because he would have to alight often and the vegetation might conceal the stumps and wreck his machine?

Col. EDGAR. The winter before there had been a field at Memphis and they had found air conditions there very satisfactory. The Memphis field was built a little later on; then the Fort Worth, Waco, Dallas, Lake Charles, in Louisiana—there we found a prairie; a wonderfully big prairie—and Wichita Falls and Houston. Then Fort Sill came along. Fort Sill is a school for the spotting of artillery. All this has been a development since the war began, and it became necessary to build at the artillery school at Fort Sill an aviation field. It is on Government property.

Senator REED. Was any influence or effort used by any one in authority to induce you to locate these fields in the South or in Texas?

Col. EDGAR. Senator, no; those fields were located in the South because of conditions I have stated. It was a patent proposition. We did not look in the North; nobody tried to use any influence with me in any way except to offer fields to me. I was offered fields all over the country, but we took what we knew could be used in the winter to get aviators over to the front. We believed we would have them there in the spring. Then in November the Aircraft Production Board passed a resolution that no more fields would be located in the North; that all fields for aviation purposes would be located where the flying could be continued throughout the year.

The CHAIRMAN. Was that the board of which Howard Coffin was president at the time?

Col. EDGAR. Yes, sir. So we started out to locate another group, and that board consisted of Col. Crabtree, Maj. Cassell, Maj. Ferron, Capt. Boyrive, a French officer, and Maj. Farron and myself. Six of us were on that board. We located a field at Lonoke, Ark.; an

additional field at San Antonio; a field at Montgomery; and two fields at Arcadia, Fla. We also located a repair depot for smashed planes in the North at Indianapolis.

Senator FRELINGHUYSEN. How far was that from Texas?

Col. EDGAR. To Indianapolis?

Senator FRELINGHUYSEN. Yes; directly; about how many miles—about 1,500, is it not?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. Why did you not locate the repair depot nearer your aviation fields in Texas?

Col. EDGAR. A repair depot, Senator, will take care of from 7 to 8 units. We have two units at Dayton, one at Rantoul, one at Belleville, and one at Mount Clemens. The Indianapolis depot takes care of and is in the center of those four units. We have a repair depot at Dallas to take care of the southern fields, and at Montgomery to take care of the southeastern fields.

Senator FRELINGHUYSEN. At Montgomery, Ala.?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. That is much nearer Texas, is it not?

Col. EDGAR. Well, the Dallas depot takes care of Texas.

Senator FRELINGHUYSEN. There is one at Dallas?

Col. EDGAR. Yes, sir; there is one at Dallas.

Senator REED. What I did not understand is why you did not locate this repair depot at some place where there was a field, not locate it away from all fields.

Col. EDGAR. The reason was that at Dayton and in the vicinity of Detroit, there were large aviation activities, calling on a great number of workmen, calling on the manufacturing strength of the town, and I did not want to put the repair depot where it was going to interfere with manufacturing. In the South, at Dallas, we put it in in connection with the fields, and the same thing in Montgomery.

Senator REED. You thought you would have a better supply of work and better facilities at Indianapolis than if you went to one of the fields in the North?

Col. EDGAR. Yes, sir. In addition I secured the use of the Speedway at Indianapolis for an aviation field without cost. They even put up hangars for us without cost, and we are in close contact with the Prestolite Co., that makes the oxy-acetylene gas that we use in repairs. We have got a very beautiful little plant there, and we think very well placed.

Morrison, Va., was the next job. That was a concentration camp to house troops and house men on the way overseas. I was detailed and went down to report to Gen. Hutcheson, who was the officer in charge of the embarkation at the port of Newport News, and that site was located by Gen. Hutcheson and myself.

The next site was the site at Americus, Ga., located by Gen. Saltzman and myself.

The next three fields were West Point, Miss., Sacramento, Cal., and Riverside, Cal. They were located by Col. Crabtree, Maj. Castle, and Mr. W. P. Stevens, a real estate man from our office.

We built two depots for the concentration of supplies, airplane supplies, and other supplies to move overseas, one at Harrisburg, Pa., and the other at Richmond, Va. We wanted to get airplane and other

supplies when they came through in quantities near to the ports, yet not in congestion at the ports, so if we could get a deckload of airplanes we could put them on board without getting underneath something. Those two places were picked out on the map by the officers in my division, myself in particular; then I sent for Maj. Benton, a traffic expert in our office, and he actually located the two sites. Harrisburg also has a big ordnance depot that has come in there since. There are two more jobs on this list; one is Langley Field. Langley Field was a job that was located and started before I came into this work. It was to be the great experimental station for aeronautics in the United States.

The CHAIRMAN. That is in Virginia, is it not?

Col. EDGAR. Near Newport News; yes, sir. It was located by Gen. Squier; Capt. Milling; Capt. Marshall, of the Quartermaster Corps; and Capt. (now Col.) Clarke. The only other job we have under way is the San Diego job, at North Island. I guess you, Senators, are familiar with that, are you not?

The CHAIRMAN. I am familiar with it. I was there last fall.

Senator REED. I am not.

Col. EDGAR. It was taken over by act of Congress from Mr. Spreckels. The Government tried to buy it, but it was commandeered. I think Mr. Kettner is the Congressman from out there; he had the handling of that bill, and it went through. It is half for the Navy.

The CHAIRMAN. That was before we entered the war?

Col. EDGAR. Yes; that was before I came down here. It is half owned by the Navy and half by the Army, and we are starting to put in one of these units on the field.

Senator REED. That completes the list?

Col. EDGAR. That completes the list.

The CHAIRMAN. You have got a branch of that San Diego field called Oti, have you not?

Col. EDGAR. That is—

The CHAIRMAN. I do not know; I am inquiring. I know they are organizing air squadrons, working them into shape, and then transferring them.

Col. EDGAR. I do not know. I am not familiar with it. The only other activity I know of in connection with San Diego is a landing field we rented a month or so ago so the men from North Island would have a chance to fly across the town and land.

Senator REED. Are all these fields now completed; and if not so, what ones are in the process of completion? What I would suggest is this—you have a tabulation showing these fields, have you not?

Col. EDGAR. Yes, sir.

Senator REED. I suggest, for the convenience of the committee, that that be put in, and that you indicate by marginal notes whether the field is completed or is in process of construction.

Col. EDGAR. Yes, sir; I shall be glad to do that.

Senator REED. And if in process of construction, about how far the construction has proceeded.

Col. EDGAR. We can give it to you on a percentage basis. We can get that list out in a day.

Senator REED. And I suggest in connection with that that you indicate when it is expected the uncompleted fields will be made complete.

Col. EDGAR. Yes, sir.

Senator REED. Is that satisfactory to the chairman?

The CHAIRMAN. Perfectly.

(The report submitted by Col. Edgar is as follows:)

<i>Report of progress on all fields, May 27, 1918.</i>		<i>Report of progress on all fields, May 27, 1918—Continued.</i>	
	Per cent.		Per cent.
Southern field, Americus, Ga----	96	Eberts field, Lonoke, Ark-----	99½
Carlstrom field, Arcadia, Fla----	100	Harrisburg, warehouse No. 1, Middletown, Pa.: Original -----	100
Door field, Arcadia, Fla-----	99	Additional -----	70
Americus warehouse, Arles, Ga--	17½	Park field, Millington, Tenn-----	100
Scott field, additional, Beleville, Ill-----	100	Hazelhurst, No. 1, additional, Mineola, Long Island: Original -----	100
Aerial postal station, Belmont Park, N. Y-----	99	Additional -----	96
Pratt Institute, Brooklyn, N. Y--	100	Selfridge field, Mount Clemens, Mich-----	100
Aerial postal station, Bustleton, Pa-----	100	Eng. plane repair depot, Montgomery, Ala-----	72
Love field, Dallas, Tex-----	100	Morrison: Original -----	100
Repair depot, Dallas, Tex-----	100	Additional -----	79
McCook field, Dayton, Ohio-----	100	Taylor field, Pike Road, Ala.: Original -----	99
Warehouse No. 1, Dayton, Ohio--	100	Additional -----	7
Wilbur Wright field, Dayton, Ohio-----	100	Chanute field, Rantoul, Ill-----	100
Balloon school, additional, Fort Omaha, Nebr-----	100	Richmond warehouse, Richmond, Va-----	100
Warehouse, Fort Sam Houston, Tex-----	20	March field, Riverside, Cal-----	99
Barron field, Fort Worth, Tex--	100	Aerial photo school, Rochester, N. Y-----	100
Carruthers field, additional, Fort Worth, Tex.: Original -----	100	Photo school, Rochester, N. Y--	100
Additional -----	21	Aviation mech. school, St. Paul, Minn-----	99
Florence field, Fort Omaha, Nebr-----	100	Brooks field, additional, San Antonio, Tex.: Original -----	100
Tallaferro, No. 1, additional, Fort Worth, Tex-----	100	Additional -----	71
Aviation supply depot, additional, Garden City, Long Island: Original -----	100	Camp John Wise, additional, San Antonio, Tex.: Original -----	100
Additional -----	62	Additional -----	82
Gerstner field, additional, Holmwood, La.: Original -----	100	Kelly field, No. No. additional, San Antonio, Tex.: Original -----	100
Additional -----	42	Additional -----	67
Ellington field, Houston, Tex----	100	Kelly field, No. 2, San Antonio, Tex-----	100
Gunnery school, Houston, Tex----	100	Kelly warehouse, San Antonio, Tex-----	100
Repair depot, Indianapolis, Ind--	100	Rich field, Waco, Tex-----	100
Post field, additional, Lawton, Okla.: Original -----	98	Payne field, West Point, Miss---	100
Additional -----	69	Call field, Wichita Falls, Tex---	100
Camp Alfred Vail, Little Silver, N. J-----	94		

Senator REED. Then we will have it all in shape.

The CHAIRMAN. Let me ask you, before you leave those fields, Colonel, whether your work includes the supply of machines, seeing that the proper number of machines for training purposes are at these fields?

Col. EDGAR. No, sir. My work under this reorganization, I understand, is to include the distribution of planes?

The CHAIRMAN. Yes.

Col. EDGAR. But we have not had the distribution of planes. We have the traffic of the Signal Corps and we ship planes when we are told to, but we have no control over where they are going or when they are to be shipped.

The CHAIRMAN. When you state you have the traffic, just what do you mean by that?

Col. EDGAR. We have the traffic branch. We had to organize such a branch in order to get our building materials through to fields, and as fast as we built up the railroad organization every other section of the Signal Corps came in and asked us to do their work, until we now have the railroad work of the entire Signal Corps. In that connection, of course, we get instructions, get bills of lading out for so many planes to be moved from place to place, and we do it.

Senator REED. Senator Frelinghuysen started to ask you a question in connection with schools.

Senator FRELINGHUYSEN. I think it might interest the committee to know what auxiliary and additional schools there are, and whether you have anything to do with them.

Col. EDGAR. I do not believe I understand your question.

Senator FRELINGHUYSEN. There is one at Princeton, for instance?

Col. EDGAR. Those are what we call "ground flying schools." They are schools for cadets, where they get preliminary training before they go to the flying fields. I have no interest in those schools at all.

The CHAIRMAN. Has there been any construction?

Col. EDGAR. There has been no construction, I believe. If there has been construction I should have done some of it.

Senator FRELINGHUYSEN. Has there been any purchase of supplies?

Col. EDGAR. In some of these schools the requisitions have been put in. I am not familiar enough with that to make a statement.

Senator FRELINGHUYSEN. Who would be familiar with it? I understand there is some uniform system of contract with those schools.

Col. EDGAR. Those contracts, the information regarding them should be gotten from headquarters, from Gen. Squier's office, or from Gen. Saltzman.

Senator FRELINGHUYSEN. I think an inquiry of that character might be well.

Col. EDGAR. I can tell you the——

Senator SMITH of Georgia. It is not your work?

Col. EDGAR. No, sir. I can tell you how that started, but I can not tell you who does it. When I went to Canada on this first trip I noticed, among other things, they did not just take cadets to a field and put them in a machine and start flying; that they had quite a serious education beforehand, and I came back and reported it. The report went to the Aircraft Board, Gen. Squier, Mr. Coffin, and the rest, and we finally picked out a group of university presidents and invited them down here. They had a meeting and these ground schools were the result of this meeting.

Senator REED. Established by a lot of university presidents?

Col. EDGAR. Yes; established by Gen. Squier and the Aircraft Production Board, with these university presidents. The colleges represented at that meeting, as I remember, were Harvard, Cornell, the University of Ohio, the University of Illinois, the University of Texas, and, I think, an Atlanta technological school.

Senator SMITH of Georgia. The Georgia Technological School?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. Was some contract made with them to train these men?

Col. EDGAR. Yes, Senator; but I do not know about that.

Senator FRELINGHUYSEN. To train them for the Government.

Col. EDGAR. Yes, sir.

Senator REED. An arrangement made with the school?

Col. EDGAR. Between the universities and the Signal Corps.

Senator SMITH of Georgia. They took the technical, or engineering and mechanical end of the university school, not the practical course?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. There was a contract, was there?

Col. EDGAR. Senator, I am absolutely ignorant of the proposition, except that these men came up here and arrangements were made with them.

Senator REED. What I want to get at is, Did those men devise a plan of training and agree to turn part of their college course over, imparting certain information which other men had determined was necessary?

Col. EDGAR. No, sir; we got the scheme of training from Canada; we took exactly what they did. Some representatives of these universities went to Canada and saw at the University of Toronto one of these schools in operation, and saw exactly what was done, and then a commanding officer was sent to each one of these schools in addition.

Senator SMITH of Georgia. To do justice to your organization, I think you ought to state what branch of the university did it? That it was the mechanical and engineering branch and not the classical branch?

Col. EDGAR. Yes, sir. The universities picked out were selected because of being land-grant colleges, they had military courses. There were some of these colleges that had already Army officers detailed and these officers took up this work.

Senator SMITH of Georgia. Is it not true you placed an Army officer at each one of the places in charge and he largely directed the work?

Col. EDGAR. Yes, sir.

The CHAIRMAN. In the case of the buildings on these fields, what course did you pursue in the construction—in the contract—was the contract let on a cost-plus basis?

Col. EDGAR. The contracts were let on the cost-plus basis.

The CHAIRMAN. And you furnished the materials?

Col. EDGAR. We furnished the buying machinery, told the contractors where to buy the stuff, and the price to pay for it. We sent auditors promptly into his organization and watched him to see that he bought the stuff at the price we told him to.

The CHAIRMAN. Was that under your supervision?

Col. EDGAR. Yes, sir.

The CHAIRMAN. Did that work satisfactorily?

Col. EDGAR. In the emergency I think it did. We established a system that was different from the quartermaster's system. We put the double audit system in. I secured the services of Mr. Bennington, one of the managing partners of Rickett & Co., Chicago, public auditors and accountants. He was made a captain and came down into my division and established an auditing section there, and we hired as promptly as we could field auditors and put them out on these jobs. We practically ran the contractor's books for him, and we checked materials that came on the fields, and checked the labor and we watched the situation from every possible angle we could.

Senator SMITH of Georgia. But you did not select the contractors?

Col. EDGAR. No, sir; we did not select the contractors.

Senator REED. All of these men who went into your organization, were they all mustered into the Army?

Col. EDGAR. Some of them came in as civilian employees; others came in and took commissions.

Senator REED. How was that arranged? Where was the dividing line between those who were to be civilians and those who were to take commissions?

Col. EDGAR. It was what is in the man's own heart. Some men would be willing to come down here and work and did not want to wear a uniform; they are willing to come down and do for their country what they can at the price we could pay. Others wanted the uniform in addition. Some of the men we have (I spoke of Maj. Bennington a moment ago) I should not have gotten as civilians. I suppose he makes \$12,000 or \$15,000 at least in his business, but he has got two brothers fighting in the English Army, and his mother is in England, and he could not have stayed here if he had not been in uniform.

Senator REED. In that particular instance, you say he could not have stayed here. Is he an Englishman?

Col. EDGAR. No; he is naturalized. He was born in England.

Senator REED. You think his folks in England would think he was not doing his duty unless he had a uniform, but how about the others? Take yourself, for instance. I am asking these things with all courtesy in the world, but I have a reason for asking them. It is entirely outside of personal reasons. Take yourself, did you desire to go into the Army or were you told it was desirable that you did?

Col. EDGAR. I have been at a military school, I have been at a military college, I had a father who, as a young boy, had lived through the Civil War, and a mother who nursed in the war hospitals; and I had pounded into me from my youth—that a man was not a man and did not have a fair chance unless he had a military education. There was no question in my mind; I wanted to go in the Army, and I wanted to go with the troops; I did not want this job, and did not want to come to Washington to stay.

Senator REED. Understand me, do not get me wrong.

Col. EDGAR. I am not getting you wrong, but I just wanted to get before you my position in the matter. I entered the Quartermaster's Corps as a captain, because it was the only thing I could get, I

was 43 years old and could not get with the troops. When Gen. Squier asked me to come down, I gave up hopes of being with an ammunition train, or a wagon train, as my chum is, and came down to Washington to do what I could.

Senator REED. That is very admirable. Now, I want to get at the question whether these men come here mostly seeking positions in the Army, whether the system is one that practically puts them in the uniform.

Col. EDGAR. No; I do not think that the system puts them in uniform. But I must say that in my work here in Washington I would much prefer to have men in uniform than to have them outside, because when they are civilians we have no control over them at all.

Senator REED. You want them in the Army, because you want them under discipline, so you can say, "Come and go"?

Col. EDGAR. Yes, sir.

Senator REED. And what you tell them to do is done?

Col. EDGAR. Yes, sir; they have to do it, or it is charged against them. I had a case yesterday of a man coming over from another division to me who had been a civilian in charge of a big section; he came and sat in my office yesterday and said:

I want to go home; I wanted to go home last January; it is a great sacrifice to stay here, and unless you let me do this, that, and the other thing, just as I want to do it, I am going to resign and leave.

If he had been an enlisted man, he would never have dared to say it in the first place.

Senator SMITH of Georgia. If he had been enlisted, he would have entered for the period of the war?

Col. EDGAR. Yes. These men who come down here at \$1 a year, and the rest of them, give wonderful service, and it is perfectly fine, but right from the start if anything goes wrong they are going to disappear—they are going to go.

Senator REED. Is there anything in this idea, that these men who occupy the positions in the Army like yourself by virtue of that are barred from making suggestions and complaints, and, being under military discipline, you must absolutely respond to a superior?

Col. EDGAR. Well, I have not found it was a drawback, except in the general disorganization we have been in during the last four or five months. I have not found that my uniform has kept me from doing a good job, as good a job as I could. I have not felt that it was any drawback at all. On the other hand, it has given me an organization that I could control, with officers.

Senator REED. We have to balance the good as well as the bad against each other. Do you think that the discipline, and the fact that you can say to a man "Come and go," overbalances any disadvantage that might come through the lack of independence.

Col. EDGAR. Yes, sir.

The CHAIRMAN. You were just speaking of the disorganization in the past few months. Is it not a fact that a man in uniform if he finds anything wrong or unsatisfactory and which should be rectified is not in a position to insist upon it, not in a position to give notice of the fact and take steps for the rectification of these bad conditions, but must report them to his superior, and his superior can do what he pleases about it?

Col. EDGAR. You can go on record; you write to your superior and say such and such is your opinion.

The CHAIRMAN. You not only go on record, but can you rectify it?

Col. EDGAR. No, sir; you could not rectify it. When not in uniform you can say, "If you do not do this get out," and the other man marches out quick, and is lost altogether.

The CHAIRMAN. Then you have the dual system, so to speak, or, rather, you have the system represented by a set of men who are in uniform, and a set of men who are not in uniform; the first are disciplined and the second may or may not be; the first are dependent and the second are independent?

Col. EDGAR. Yes, sir.

The CHAIRMAN. How does such a system work, taking into consideration the very fact indicated, the disorganization?

Col. EDGAR. That depends entirely upon the personality of the man who is the leader. If you have enough personality and can throw enough enthusiasm into your subordinates, they will work for you in uniform or out, but in my work I have been turning more and more in our division toward the military; I have some in uniform, and some have left. We have one or two down there. I have one personal friend, Mr. Stephens, down there, who is devoted to me and will stick through thick and thin and does not want to go into uniform, and I have not tried to persuade him; but he is an unusual chap. We have Mr. Faber down there, who is too old to be in uniform.

The CHAIRMAN. I have been told by a number of men in the service, in the Aviation Service, but not in uniform, that their reports of bad conditions and their efforts to secure changes and betterments have produced nothing; they resulted in nothing because the only authority which exists is in the discipline of the uniformed force, and that that has crystallized, so to speak; complaints amount to nothing, notifications amount to nothing; and because of that situation we are without aeroplanes and in a somewhat disorganized situation. I do not know whether that is so.

Col. EDGAR. Senator, I am not familiar with the production side at all. I have been called into their conferences once or twice, but I am not familiar with it. I do not believe that there has been any handicap on the one side or on the other.

The CHAIRMAN. It is a fact, is it not, that contracts and payments of money, and so forth, must all be done through the military branch of the aviation force?

Col. EDGAR. Yes, sir.

The CHAIRMAN. In other words, Gen. Squier is really, or was until he was superseded, really the business as well as the military head of that section?

Col. EDGAR. He is responsible for all the moneys and responsible for everything done in the Signal Corps.

The CHAIRMAN. And responsible for everything that was not done?

Col. EDGAR. Yes, sir.

The CHAIRMAN. Now, a number of the men who were somewhat prompt in the matter of production, but not in uniform, have told me that largely because of that situation, to use the expression of one

of them, they could not get anywhere. They would find a difficult situation and report, and Gen. Squier would make a note of it and pass it on to somebody else, and that would be the last of it.

Senator SMITH of Georgia. I do not think you ought to ask him to criticize his superiors.

The CHAIRMAN. I am not asking the colonel to criticize or to pass judgment upon his superiors, but I am asking him about the conditions with a view of determining just who is in absolute power, and whether anything can be done except through the military branch of the organization.

Col. EDGAR. The absolute power is with the chief of the corps, undoubtedly; it is through the military. I have not had the civilian experience down here, and what I have done in keeping up with our plans and getting our fields through in time has been done with the uniform.

Senator FRELINGHUYSEN. I should like to suggest, Mr. Chairman, that an inquiry be made into the cost of the cantonments, the selection of the contractors, the locations, and the question of the reliability of the contractors.

The CHAIRMAN. Maj. Jones, did you not some time ago give the committee a statement regarding that subject?

Col. JONES. No, sir.

The CHAIRMAN. Showing the amount of money contracted for, the amount expended, and the amount yet to be paid upon contracts? My recollection is you did. We called you here in connection with the Miami field, those questions were asked, and I think you submitted a statement.

Col. JONES. The 24th of March, when I first appeared before this committee, I gave the names of all our fields and the percentage of which they were completed, and also the cost up to that date.

The CHAIRMAN. And also the amount of the contracts, as well as you could, if I remember?

Col. JONES. Yes, sir; I think I did; I will get the record.

The CHAIRMAN. I think that is in the record.

Senator REED. We ought not to duplicate it.

Col. EDGAR. It appeared in my testimony before the House committee, and I think it appeared here also. I have here a statement, or an addition, of the training plants completed and under construction, showing the rental for the year of operation, the price of option, the purchase price, the cost of land, the cost of sewers, roads, and grading, drainage, and cost of buildings, etc.

Senator REED. That is pretty nearly everything now excepting the names of the contractors.

The CHAIRMAN. Maj. Jones calls my attention to his testimony on pages 2491, 2492, and 2493, which are statements showing the estimated costs of all projects constructed or under construction in the United States up to March 25, 1918, and actual cash disbursements in respect to same, so we have that testimony.

AIRCRAFT PRODUCTION.

19

SUPPLY DIVISION, SIGNAL CORPS.

Statement showing estimated cost of all projects constructed or under construction in the United States up to Mar. 25, 1918, and actual cash disbursements in respect of same.

Location.	Description.	Estimated cost.	Payments to date.
Americus, Ga., Southern field.....	1 4-squadron camp.....	\$812,100	\$20,781
Do.....	Warehouse.....	400,000	.....
Arradia, Fla., Carlstrom field.....	1 4-squadron camp.....	812,100	480,052
Arradia, Fla., Door field.....	do.....	812,100	135,430
Belleville, Ill., Scott field.....	do.....	1,680,529	1,583,866
Dallas, Tex., Love field.....	do.....	929,100	887,653
Dallas, Tex.....	Repair depot.....	551,500	450,263
Dallas, Tex., concentration camp.....	Miniature range building and sundry equipment for existing buildings.	16,766	11,766
Dayton, Ohio.....	Supply depot.....	800,000	753,533
Dayton, Ohio, McCook field.....	Experimental station.....	920,100	721,055
Dayton, Ohio, Wilbur Wright field.....	1 8-squadron camp, including gunnery school.	3,097,777	2,878,699
Fort Omaha, Nebr.....	Balloon school.....	472,266	428,181
Fort Omaha, Nebr., Florence field.....	Additional balloon unit.....	77,000	1,295,734
Fort Sill, Okla., Post field.....	Aerial observers' camp.....	1,485,480	179,522
Fort Sill, Okla.....	Balloon school.....	385,000	1,061,495
Fort Wood, N. Y.....	Supply depot, addition to building....	47,000	47,000
Fort Worth, Tex., Taliaferro No. 1.....	1 4-squadron camp.....	1,121,600	1,061,495
Fort Worth, Tex., Taliaferro No. 2.....	do.....	1,007,100	985,524
Fort Worth, Tex., Taliaferro, No. 3.....	do.....	857,100	815,632
Houston, Tex., Ellington field.....	1 8-squadron camp.....	2,130,900	2,020,493
Indianapolis, Ind.....	Repair depot.....	582,000	470,245
Lake Charles, La., Gerstner field.....	1 8-squadron camp.....	2,266,600	2,188,121
Little Silver, N. J., Camp Alfred Vail...	Radio laboratory.....	368,350	141,716
Lonoke, Ark., Eberts field.....	1 4-squadron camp.....	812,100	460,465
Memphis, Tenn., Park field.....	do.....	1,672,100	1,633,335
Middletown, Pa.....	Supply depot.....	613,000	610,589
Do.....	Additional warehouse.....	800,000	800,000
Mineola, L. I., Hazelhurst field.....	1 5-squadron camp and 1 concentration camp and general aviation supply depot.	4,217,399	3,907,232
Montgomery, Ala., Taylor field.....	1 4-squadron camp.....	812,100	332,799
Montgomery, Ala.....	Repair depot.....	600,000	.....
Morrison, Va.....	Concentration camp.....	1,603,100	1,536,402
Mount Clements, Mich., Selfridge field...	1 4-squadron camp.....	2,303,203	2,015,289
Rantoul, Ill., Chanute field.....	do.....	1,090,482	1,053,015
Richmond, Va.....	Supply depot.....	1,000,000	992,856
Riverside, Cal.....	1 4-squadron camp.....	800,000	18,981
Sacramento, Cal.....	do.....	850,000	18,981
San Antonio, Tex., Kelly field.....	1 8-squadron camp, 1 concentration camp, and 2 storage warehouses.	3,443,655	3,117,352
San Antonio, Tex., Brooks field.....	1 4-squadron camp.....	812,100	549,296
San Antonio, Tex.....	Balloon school.....	144,480	65,451
San Diego, Cal., Rockwell field.....	Temporary buildings, construction of bridge and part of temporary buildings.	1,087,200	.....
Waco, Tex., Rich field.....	1 4-squadron camp.....	1,016,600	961,413
Waco, Tex., Camp McArthur.....	Barracks and quarantine camp.....	192,000	186,200
West Point, Miss., Payne field.....	1 4-squadron camp.....	812,100	32,383
Wichita Falls, Tex., Call field.....	do.....	1,016,600	936,190
Wichita Falls, Tex., various fields.....	Provision for miscellaneous construction work (transferred to Quartermaster General).	200,090	.....
Hampton, Va., Langley field.....	Permanent and temporary buildings..	3,664,050	2,305,697
SUNDRY PROJECTS.			
Ft. Mifflin, Pa.....	Temporary barracks.....	5,732	5,653
Fort Oglethorpe, Ga.....	Equipment building.....	2,000	.....
Washington, D. C., Smithsonian Institution.	Storage buildings.....	22,500	21,757
Do.....	Equipment and fittings.....	2,800	2,800
Brooklyn, N. Y.....	Alteration to building.....	15,000	.....
Washington, D. C., polo grounds.....	Steel hangar.....	10,000	.....
Rochester, N. Y.....	Photographic school.....	35,000	6,853
Long Beach, L. I.....	Alterations to buildings.....	13,000	.....
Hampton, Va., Langley field.....	Portable houses and supplies.....	36,813	36,313
San Antonio, Tex.....	20 canvas hangars.....	11,249	.....
Do.....	196 canvas hangars.....	13,820	.....
Do.....	12 canvas hangars.....	6,750	6,750
Do.....	77 canvas hangars.....	42,581	42,581
Do.....	24 canvas hangars.....	14,016	14,016
Do.....	Architectural services.....	150,000	118,802

AIRCRAFT PRODUCTION.

SUPPLY DIVISION, SIGNAL CORPS—continued.

Statement showing estimated cost of all projects constructed or under construction in the United States up to Mar. 25, 1918—Continued.

Location.	Description.	Estimated cost.	Payments to date.
Washington, D. C., 119 D Street.....	Fire escapes.....	\$3,814	\$3,407
Do.....	Exhaust fans and ventilators.....	7,098	.....
Washington, D. C., radio buildings.....	Partitions and heating system.....	4,500	.....
Do.....	Alterations.....	4,700	.....
Mexican border.....	10 pigeon lofts.....	4,500	.....
Greenville, S. C., Camp Sevier.....	Construction work.....	5,000	3,379
Do.....	Officers' quarters, truck shed, and storehouse.....	4,500	3,609
Washington, D. C., Arcade Building.....	Alterations.....	5,000	.....
Washington, D. C., 1607 H Street NW.....	do.....	2,000	.....
Do.....	do.....	3,000	.....
Do.....	Sundry equipment and supplies.....	6,483	.....
	Rental of land..... \$478,059		
	Purchase of land..... 401,481		
		879,540	.....
		52,511,134	39,356,607

NOTE.—Further projects, the estimated cost of which is \$6,000,000, have been approved by the Aircraft Board, but have not as yet received the approval of the Secretary of War.

Reconciliation of estimated costs and actual cash disbursements for construction in United States Army, as shown by weekly statement dated Mar. 25, 1918, showing totals as of Mar. 22, 1918, and by statement dated Mar. 25, 1918, showing totals to that date.

RECONCILIATION OF ESTIMATED COSTS.

Totals shown on weekly statement dated Mar. 25, 1918, as of Mar. 22, 1918:

	Estimated cost.
Construction, United States Army.....	\$49,202,193
Langley field.....	3,664,050
Leasing of land.....	478,060
Purchase of land.....	401,481
	53,745,784

Deduct (projects abandoned and overestimates):	
Steel hangars, various fields.....	\$980,000
Surplus of authority for gunnery school, Dayton, Ohio.....	100,000
Construction, Camp Mills, Long Island, N. Y.....	300,000
Fort Sill balloon school, overestimated.....	36,000
Work on steel hangars, Waco, Tex.....	750
	1,366,750

Less—		
Adjustment voucher increasing previous estimates, Dayton, Ohio, Wilbur Wright.....	\$75,000	
Increase on Newport News, Va.....	53,100	
Increase on Dayton, Ohio, McCook.....	4,000	
	182,100	
		1,234,650

Total shown on statement dated Mar. 25, 1918, representing totals to that date.....	52,511,134
---	------------

RECONCILIATION OF ACTUAL CASH DISBURSEMENTS.

Totals shown on weekly statement dated Mar. 25, 1918, as of Mar. 22, 1918:

Construction: United States Army-----	\$36, 691, 805
Langley field-----	2, 262, 698

38, 954, 503

Payments made during period from Mar. 22 to 25, 1918-----	402, 104
---	----------

Total shown on weekly statement dated Mar. 23, 1918, representing totals to that date----- 39, 356, 607

Senator FRELINGHUYSEN. I would suggest that it be brought up to date.

Col. EDGAR. I have it here up to date, up to May 27.

DEPARTMENT OF MILITARY AERONAUTICS.

Rentals of land to June 30, 1918.

Camp Souther, Americus, Ga., rental of land-----	\$2, 700. 32
Carlstrom Field, Arcadia, Fla., rental of land-----	186. 67
Dorr Field, Arcadia, Fla., rental of land-----	173. 33
Scott Field, Belleville, Ill., rental of land-----	37, 900. 52
Brooklyn, N. Y., rental of building-----	2, 500. 00
Love Field, Dallas, Tex., rental of land-----	8, 659. 48
Dallas Fair Park, Dallas, Tex., rental of land-----	1. 00
McCook Field, Dayton, Ohio, rental of land-----	9, 493. 26
Wilbur Wright Field, Dayton, Ohio, rental of land-----	18, 404. 59
Final testing field, Dayton, Ohio, rental of land-----	2. 00
Detroit, Mich., rental of building-----	60, 000. 00
Final testing field, Detroit, Mich., rental of land-----	5, 000. 00
Tallaferro Field, Fort Worth, Tex., rental of land-----	3, 558. 80
Barron, Fort Worth, Tex., rental of land-----	3, 815. 58
Carruthers Field, Fort Worth, Tex., rental of land-----	3, 546. 60
Target range, Fort Worth, Tex., rental of land-----	1, 415. 76
Warehouse, Harrisburg, Pa., rental of land-----	14, 950. 00
Ellington Field, Houston, Tex., rental of land-----	3, 932. 75
Aerial observation range, Houston, Tex., rental of land-----	335. 00
Engine repair depot, Indianapolis, Ind., rental of land-----	1, 418. 16
Photographic school, Ithaca, N. Y., rental of building-----	533. 33
Erie Dock warehouse, Jersey City, N. J., rental of building-----	50, 500. 00
Gerstner Field, Lake Charles, La., rental of land-----	1, 088. 84
Eberts Field, Lonoke, Ark., rental of land-----	101. 00
Park Field, Memphis, Tenn., rental of land-----	56, 678. 96
Gunnery school, Miami, Fla., rental of land-----	1, 227. 19
Experimental station, Miami, Fla., rental of land-----	1. 00
Hazelhurst Field, Mineola, Long Island, N. Y., rental of land-----	16, 956. 85
Taylor Field, Montgomery, Ala., rental of land-----	1, 866. 67
Warehouse, Montgomery, Ala., rental of land-----	3, 155. 15
Selfridge Field, Mount Clemens, Mich., rental of land-----	13, 500. 00
Concentration camp, Newport News, Va., rental of land-----	1, 430. 83
Chanute Field, Rantoul, Ill., rental of land-----	12, 800. 00
Supply depot, Richmond, Va., rental of land-----	4, 464. 50
Richmond, Va., rental of warehouse-----	5, 250. 00
March Field, Riverside, Cal., rental of land-----	1. 00
Photographic school, Rochester, N. Y., rental of parts of buildings-----	1. 00
Protographic school, Rochester, N. Y., rental of land-----	1. 00
Sacramento, Cal., rental of land-----	1. 00
Kelly Field, San Antonio, Tex., rental of land-----	85, 010. 85
Brooks Field, San Antonio, Tex., rental of land-----	15, 095. 33
Balloon school, San Antonio, Tex., rental of land-----	1, 156. 38
Missouri Aeronautical Society Camp, San Antonio, Tex., rental of land and buildings-----	1. 00
Rockwell Field, San Diego, Cal., rental of railroad line-----	60, 000. 00

AIRCRAFT PRODUCTION.

Landing field, San Diego, Cal., rental of land.....	\$12,336.00
Rich Field, Waco, Tex., rental of land.....	6,309.91
Payne Field, West Point Miss., rental of land.....	3,233.47
Call Field, Wichita Falls, Tex., rental of land.....	1,177.02
Total.....	531,872.16

Purchase of land.

40 acres of land for supply depot, Dayton, Ohio.....	\$8,000.00
Hawaiian depot, Ford Island.....	235,262.00
Aviation site, San Antonio, Tex.....	158,219.17
Site for balloon observers' school, Lee Hall, Va.....	100,000.00
Total.....	501,481.17
Grand total.....	1,033,353.33

SUPPLY SECTION, MILITARY AERONAUTICS DIVISION.

List of construction work showing estimated and actual cost of each project as of May 24, 1918.

Location.	Description.	Estimated cost.	Payments to date.
Americus, Ga., Souther Field.....	1-4 squadron camp.....	\$840,000	\$484,000
Anacostia, D. C.....	Experiment station.....	60,000	.....
Americus, Ga., Souther Field.....	Warehouse.....	406,663	6,663
Arcadia, Cal.....	Balloon school funds transferred to construction division.	400,000	.....
Arcadia, Fla., Carlstrom Field..	1-4 squadron camp.....	836,382	811,029
Arcadia, Fla., Dorr Field.....	.....do.....	834,639	690,145
Belleville, Ill., Scott Field.....	.....do.....	1,684,988	1,654,915
Buffalo, N. Y., Acceptance Park	Buildings for final testing field—Funds transferred to construction division.	380,000	380,000
Dallas, Tex., Love Field.....	1-4 squadron camp.....	1,080,800	1,017,630
Dallas, Tex.....	Repair depot.....	599,381	583,537
Dallas, Tex., concentration camp.	Miniature range building and sundry equipment	16,766	11,766
Dayton, Ohio.....	Supply depot.....	853,049	832,601
Dayton, Ohio, McCook Field.....	Experiment station.....	1,059,052	779,274
Dayton, Ohio, Wilbur Wright Field.	1-8 squadron camp including gunnery school.	3,215,295	3,048,551
Dayton, Ohio, Acceptance Park..	Buildings for final testing field.....	362,973	2,973
Detroit, Mich., Acceptance Park..	Buildings for final testing field—Funds transferred to construction division.	120,000	120,000
Detroit, Mich., Saxon Motor Co. plant.	Alterations, etc., funds transferred to construction division.	41,500	41,500
Elizabeth, N. J., Acceptance Park.	Buildings for final testing field—Funds transferred to construction division.	59,000	59,000
Fort Omaha, Nebr.....	Balloon school and additional balloon unit...	621,368	504,585
Fort Sam Houston, Tex.....	Storehouse.....	200,064	17,447
Fort Sill, Okla., Post Field.....	Aerial observers' camp.....	1,505,558	1,479,181
Fort Sill, Okla.....	Balloon school.....	389,649	312,298
Fort Wood, N. Y.....	Supply depot, addition to building.....	47,000	47,000
Fort Worth, Tex., Taliaferro Field.	1-4 squadron camp.....	1,159,063	1,150,236
Fort Worth, Tex., Barron Field..	.....do.....	1,081,130	1,058,338
Fort Worth, Tex., Carruthers Field.	.....do.....	938,005	892,036
Houston, Tex., Ellington Field..	1-8 squadron field.....	2,137,083	2,060,001
Indianapolis, Ind.....	Repair depot.....	593,093	574,998
Lake Charles, La., Gerstner Field.	1 eight-squadron camp.....	2,368,929	2,242,934
Leehall, Va.....	Balloon observation school—funds transferred to construction division.	762,650	762,650
Little Silver, N. J., Camp Alfred Vail.	Radio laboratory.....	410,042	323,190
Lonoke, Ark., Eberts Field.....	1 four-squadron camp.....	1,402,375	1,294,720
Memphis, Tenn., Park Field.....	.....do.....	1,909,575	1,899,448
Miami, Fla.....	Gunnery school—funds transferred to construction division.	306,994	306,994
Do.....	Experimental station.....	13,534	.....
Middletown, Pa.....	Supply depot.....	634,344	613,471
Do.....	Additional warehouse—funds transferred to Quartermaster Department.	1,181,400	1,181,400
Mineola, Long Island, Hazelhurst Field.	1 five-squadron camp, 1 concentration camp and general aviation supply depot.	4,651,487	4,358,646
Minneapolis, Minn.....	Mechanics' school.....	154,038	94,760

SUPPLY SECTION, MILITARY AERONAUTICS DIVISION—continued.

List of construction work showing estimated and actual cost of each project as of May 24, 1918—Continued.

Location.	Description.	Estimated cost.	Payments to date.
Montgomery, Ala., Taylor Field...	1 four-squadron camp.....	\$839,961	\$819,788
Montgomery, Ala.....	Repair depot.....	612,423	54,742
Morrison, Va.....	Concentration camp.....	2,026,775	1,911,575
Mount Clemens, Mich., Selfridge Field.	1 four-squadron camp.....	2,409,964	2,179,774
Rantoul, Ill., Chanute Field.....	do.....	1,161,797	1,054,877
Richmond, Va.....	Supply depot.....	1,062,536	993,536
Riverside, Cal., March Field.....	1 four-squadron camp.....	826,982	204,772
Sacramento, Cal., Mather Field.....	do.....	876,962	78,048
San Antonio, Tex., Kelly Field....	1 eight-squadron camp, 1 concentration camp and 2 storage warehouses.	3,808,797	3,659,376
San Antonio, Tex., Brooks Field..	1 four-squadron camp.....	1,089,425	1,030,103
San Antonio, Tex., John Wise....	Balloon school.....	231,374	177,901
San Diego, Cal., Rockwell Field...	Temporary buildings, construction of bridge and part of temporary buildings.	1,009,845	117,814
Waco, Tex., Rich Field.....	1 four-squadron camp.....	1,092,108	1,001,502
Waco, Tex., Camp MacArthur....	Barracks and quarantine camp.....	228,100	186,200
West Point, Miss., Payne Field...	1 four-squadron camp.....	847,654	775,814
Wichita Falls, Tex., Call Field....	do.....	1,054,751	983,974
		54,506,323	46,927,693
Various fields.....	Provisions for miscellaneous construction work (transferred to Q. M. General).	200,000	200,000
Do.....	Architectural service.....	150,000	118,802
Sundry projects.....		361,491	203,255
Steel hangars for erection at various fields.		2,000,000	1,744,219
Total.....		57,217,814	49,193,969
Deduct items chargeable to allotment of other divisions.		461,600	
Total.....		56,756,214	

Construction abroad.

Projects.	Estimated cost.	Actual cost.
Aviation school in France.....	\$692,703	\$636,492
Plans for sewerage, electricity, etc. (France).....	6,000	6,000
Funds placed at the disposal of Col. Russell in connection with overseas training camp.....	100,000	
Construction of aviation school repair shops, depots, and incidental expenses for overseas camp.....	500,000	91,044
Material for 11 motor assembly shops for American Expeditionary Forces.....	900,000	358,416
Construction of assembling plants, aerodromes, and miscellaneous buildings.....	9,000,000	
	11,198,703	1,091,952

[The funds for this project are to be provided out of an allotment of \$4,500,000, formerly known as S. S. A. 17-18, and now described as S. S. A.]

Commitment for construction work, Langley Field, Hampton, Va.

Plans	\$6,000
Construction of experiment station.....	2,000,000
Additional construction work.....	1,000,000
Construction of temporary buildings for use of French and Italian airplanes and personnel.....	61,900
Construction of additional temporary buildings.....	250,000
One temporary hangar to house one Caproni triplane.....	5,000
Two temporary hangars to house two Caproni biplanes at \$5,000 each	10,000
For construction of concrete road and railroad.....	50,000

AIRCRAFT PRODUCTION.

Sheathing of temporary barracks, mess hall, and post exchange building-----	\$1, 000
Buildings being purchased direct by this division for temporary school for aerial observers-----	160, 000
Buildings for temporary school for aerial observers-----	120, 150
Building for wind tunnel instrument-----	100, 000
One wind tunnel instrument-----	6, 000
Purchase of land-----	15, 000
	3, 785, 050
Amount credited to order No. 8451 as a provision for additional construction work -----	771, 950
	4, 557, 000
Payments made on above work up to and including May 24, 1918----	3, 629, 402

DEPARTMENT OF MILITARY AERONAUTICS.

Allotments available for purchase of land and construction of buildings in the United States and abroad.

	Purchase and leasing of land.	Construction in United States.	Construction abroad.	Total.
Allotment S. S. A. 17-18.....	\$3, 500, 000	\$9, 202, 710		\$12, 702, 710
Allotment S. S. A. 18.....	16, 647	20, 000		36, 647
Allotment I. A. S. C. 18.....	7, 250, 000	18, 552, 400	\$15, 654, 000	41, 456, 400
	10, 766, 647	27, 775, 110	15, 654, 000	54, 195, 757
Deduct— Amount cancelled under allotment S. S. A. 17-18 as per request of Equipment Division, appropriation section.....	3, 007, 887			3, 007, 887
	7, 758, 760			51, 187, 870
Amount transferred to construction United States Army.....	6, 300, 000	10, 755, 297	4, 455, 297	
Add— Authority to overobligate allotment given by Chief Signal Officer, Mar. 14, 1918.....		20, 906, 145		20, 906, 145
	1, 458, 760	59, 436, 552	11, 198, 703	72, 094, 015
Less commitments.....	1, 033, 353	55, 756, 214	11, 198, 703	68, 988, 270
	425, 407	2, 680, 338		3, 105, 745
Projects approved by Aircraft Production Board but not yet authorized.....				2, 072, 352
Amount available for future projects, leasing of land, etc.....				1, 033, 353

The above figures do not include Langley Field, Hampton, Va.

Senator REED. In this tabulation, which you have handed the committee, which is headed, "Statement of aviation training camps, warehouse and Signal Corps activities, completed or under construction, Supply Division, Signal Corps," are all of these camps completed?

Col. EDGAR. No, sir; there is a statement down at the bottom, the estimated cost, \$800,000. There are eight of them that are not completed.

Senator REED. They have got a cross after them?

Col. EDGAR. Yes, sir.

Senator REED. All the others are completed?

Col. EDGAR. Yes, sir.

Senator REED. Are the buildings at Belleville, Ill., of the standard kind?

Col. EDGAR. Yes, sir.

Senator REED. And the buildings at Dallas, Tex., are also of the standard kind?

Col. EDGAR. Yes, sir; only they are a thinner building than at Belleville, Ill. They are reduced to one layer, because they are in a southern country. We did it on that account and pretty nearly froze to death down there last winter.

Senator REED. There are two at Dallas, Tex.; one \$650,000?

Col. EDGAR. One is a repair depot.

Senator REED. I see; the last one?

Col. EDGAR. Yes, sir.

Senator REED. Here is a building at Belleville, Ill.; building cost, \$400,000. At Dallas, Tex., the same building cost \$650,000?

Col. EDGAR. Yes, sir.

Senator REED. You say they were too thin?

Col. EDGAR. The buildings were reduced in cost over the northern type. The Belleville building is the northern type of building.

Senator REED. That is, by cutting the material down?

Col. EDGAR. Yes.

Senator REED. The building at Dayton, Ohio, that is \$525,000?

Col. EDGAR. Dayton, Ohio, the Wilbur Wright Field, is the one you want to compare with, that is the double unit.

Senator REED. The one I have here is Dayton, Ohio, the warehouse?

Col. EDGAR. That is a concrete warehouse; that is something entirely different.

Senator REED. The Dayton, Ohio, Wilbur Wright Field, that is \$400,000.

Col. EDGAR. That is double, two fields.

Senator REED. That is \$1,800,000?

Col. EDGAR. Yes, sir. Belleville, \$400,000 for one-half. That is on the same basis, just about.

Senator REED. That is a double field?

Col. EDGAR. Yes, sir.

Senator REED. What do you mean by a double field?

Col. EDGAR. Two of these, twice as big as that.

Senator FRELINGHUYSEN. Does the Government own the land?

Col. EDGAR. No, sir; the Government owns the land the warehouse is on; that is the only land it owns there. It has an option price to purchase this land at \$350,000; that is, 2,245.20 acres in that field; rental, \$20,000 per year.

Senator FRELINGHUYSEN. That is about 8 per cent?

Col. EDGAR. The purchase price is \$156 an acre.

Senator FRELINGHUYSEN. Who owns the land?

Col. EDGAR. It is owned by the State of Ohio.

Senator FRELINGHUYSEN. Does Col. Deeds own any of that land?

Col. EDGAR. Not to my knowledge; it is owned by the State. He is chairman of the State Board of the Miami Conservation Commission.

Senator FRELINGHUYSEN. Are any of the men interested in aircraft production, on the Aircraft Production Board, at all interested in that land?

Col. EDGAR. At Dayton?

Senator FRELINGHUYSEN. Yes.

Col. EDGAR. No, sir.

Senator FRELINGHUYSEN. Or in any land that you know of?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. Where?

Col. EDGAR. Americus; that is owned by E. C. Grace interests. It was bought by the Graces, and Grace is an officer in the Signal Corps. He was the hardest fellow I had to do business with.

Senator SMITH of Georgia. I did not know he was an officer in the Signal Corps. We had to beg him and beg him and beg him to get him to let us have it.

Senator REED. I was talking about the cost of these buildings. I observe that at Belleville, Ill., the cost was \$900,000?

Col. EDGAR. Yes, sir.

Senator REED. And at Dayton, Ohio, the Wilbur Wright Field, you state is a double field—the cost was \$1,800,000, which brings us back again to \$900,000?

Col. EDGAR. Yes, sir.

Senator REED. Then I observe at Fort Sill it is \$850,000?

Col. EDGAR. Yes, sir.

Senator REED. That is a variation of \$50,000?

Col. EDGAR. There is a variation.

Senator REED. But when we get down to the next field, the Fort Worth (Tex.), Camp Taliaferro, that is \$650,000?

Col. EDGAR. Yes, sir; that is the same kind of field as Dallas.

Senator REED. There are two of those?

Col. EDGAR. Three of them, Senator.

Senator REED. One of them is a target range, is it not?

Col. EDGAR. Yes, sir; there are three camps there.

Senator REED. Those camps—one of them drops to \$600,000, I believe, here?

Col. EDGAR. Yes, sir.

Senator REED. But as I go on down I find at the bottom of the list, among those that are uncompleted, field Lonoke, Ark.; it begins with \$650,000. Those are estimates?

Col. EDGAR. Those are estimates; no; not entirely estimates; they are estimated for the balance.

Senator REED. They are not complete?

Col. EDGAR. They are not complete.

Senator REED. For the purpose of my question that is sufficient. I do not understand how these all come out in even figures, \$650,000. Are they the same contractors doing the work?

Col. EDGAR. No, sir; the same type of building; the same material; and they are estimates based on the work that we have done and the figures we are getting out.

Senator REED. That is, the last six down here, beginning Lonoke, Ark.?

Col. EDGAR. Yes, sir.

Senator REED. But up above that we have these figures, \$650,000, repeated there two or three times, although the freight rates must be very different and the costs must be different. I do not understand how they come out so.

Col. EDGAR. We have gotten Maj. Bennington to separate out his buildings from the rest in cost. They all come in to us merged: while the freight rates on those southern camps are pretty close to

being the same, they are not exactly the same. The variation is in the roads, grades, and drainage, I believe.

Senator SMITH of Georgia. Do you mean that the cost of two big buildings comes out to the dollar the same?

Col. EDGAR. No, sir.

Senator SMITH of Georgia. The final result?

Col. EDGAR. That is not a fair statement to make—that they have come out even. We have estimated the buildings as separate from the grading in those figures. The total of the two is the total cost.

Senator REED. The same contractors did the grading and put up the buildings, did they?

Col. EDGAR. Yes, sir.

Senator REED. And you have, then, sort of allocated the cost between the two?

Col. EDGAR. There has been an allocation between the two, based upon what we have judged the cost of the buildings to be.

Senator REED. But you did not keep separate accounts?

Col. EDGAR. We could not keep separate accounts; it could not be done the way we were working or under the pressure we were working.

Senator SMITH of Georgia. Take the two costs——

Col. EDGAR. Here is the first one. For instance, the two cost a million and a half dollars.

Senator REED. What two do you mean now?

Col. EDGAR. The buildings and the grading and the road and the sewerage together cost \$1,500,000 at Belleville. We estimated the buildings at \$900,000 and the grading at \$654,000. Those figures were made up in our office from material, from everything that had been supplied to put in the buildings, and from an adjustment of the labor.

Senator REED. Then, to make it plain in the record, and as an illustration, it amounts to this: If we take the first item in your chart, which is Belleville, Ill., and where the buildings are put in at \$900,000, the real fact is that your total cost there was \$1,534,474.27?

Col. EDGAR. Yes, sir.

Senator REED. And that is under the column "Grand total"?

Col. EDGAR. Yes, sir.

Senator REED. Now, in endeavoring as well as you could to find where that money was expended and to allocate it properly you put it roads and sewers, grading and drainage, at \$654,474.27, and then the buildings, at \$900,000, and the total of those two is the result?

Col. EDGAR. And the cost of the field, that is what it equals.

Senator REED. It equals the cost of the field. Does that also include the rental that is paid out?

Col. EDGAR. No, sir; that figure of \$900,000, if you will permit me, is made up of the cost of all the materials that went into those buildings and an adjustment of the labor between grading and buildings. That is how that \$900,000 is gotten. It is not a guess and it is not actual.

Senator REED. I do not mean that it is a guess; I am not so characterizing it.

Col. EDGAR. I just want to explain to you fully. I am very glad you brought it out.

Senator REED. The figures would look without that explanation exceedingly suspicious?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. And the real cost of your field is found down in your total cost?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. Your last column is an allotment, because out of the total cost in round figures you, not having paid for the building separately, but having paid the man doing the work for it as a whole?

Col. EDGAR. Yes. In that connection one contractor built three fields at Fort Worth, Tex. We built Nos. 1, 2, and 3; we built Nos. 1 and 2; field No. 3 was a field which had to have much less grading than the other two fields. We allotted for the buildings \$600,000 and grading \$63,000. There was the same contractor for those three fields.

Senator FRELINGHUYSEN. At cost plus?

Col. EDGAR. Yes.

Senator FRELINGHUYSEN. How much percentage plus?

Col. EDGAR. It was the regular standard percentage printed in the Government contract. It was reduced here a month or two ago. It started with the 10 per cent, I believe, and now it is 7, with a maximum fee.

Senator REED. What is the maximum fee?

Senator SMITH of Georgia. In proportion to the size of the job, is it not?

Col. EDGAR. No, sir; they have a maximum fee of \$250,000, as I remember it.

Senator REED. How many of these fields were built by any one contractor and who is it?

Col. EDGAR. One contractor built all three jobs at Fort Worth.

Senator REED. Who was that?

Col. EDGAR. I think his name is T. W. Thompson. I will put that in the record. I do not remember offhand.

Senator REED. Was his work satisfactory?

Col. EDGAR. Yes, sir.

Senator REED. You had no complaint to make of it?

Col. EDGAR. No, sir.

Senator REED. Do you think there was any waste down there, avoidable waste?

Col. EDGAR. Yes, sir; I do. I think there has been avoidable waste on every one of these jobs.

Senator REED. I mean avoidable waste. Avoidable waste is not the correct term, but was there any waste beyond that which is practically inevitable in doing rush work of this kind.

Col. EDGAR. I do not think there has been. I do believe this, Senator, as we do this job over and over again we should improve all the time, and we believe in the California jobs we are going to have lower costs than we have ever had before. We bring our engineers in when these jobs are over and he runs them from one end to the other and figures out how to save money. One of the first jobs we built we put up temporary buildings for our labor, as is usual, and in the next construction we housed them in hangars, and when we got the men out

we had the buildings all finished and no extra cost, so we have saved from time to time. Some camps we have not had to put up any temporary buildings to amount to anything, and we are learning as we do this thing over and over again. I felt pretty badly when it was taken away from me and given to the construction division, because they have got to go to work and relearn all we learned this year at the Government expense.

The CHAIRMAN. You spoke a few moments ago about the fact that while these construction plans contemplated accommodation of some 972 men, under all conditions they have been largely overcrowded.

Col. EDGAR. Yes, sir; very largely overcrowded.

The CHAIRMAN. Let me ask whether these overcrowds were of a character that should have been met by additional buildings? I will put it in a different way. Were you notified before these additional people were sent to these places?

Col. EDGAR. I have had no knowledge of it at all until we heard it from our engineers on the ground.

The CHAIRMAN. What was its effect upon the sanitary conditions there?

Col. EDGAR. It is very bad; the effect upon the septic tanks is particularly bad. At one stage of the work last winter at one of the fields at Fort Worth they had to ship tank cars of water in to give the men water to wash in.

The CHAIRMAN. By whose order were these additional men sent to these camps?

Col. EDGAR. I have not that information, Senator. The Fort Worth camps were part English and part American. They were under Col. Roscoe, but the movement of the reserve, I imagine, is handled here in Washington.

The CHAIRMAN. The shelter was insufficient for this added number of men, was it not?

Col. EDGAR. Yes, sir; the shelter was insufficient, but they got around that by putting up tents.

The CHAIRMAN. That would be only a temporary shelter in winter?

Col. EDGAR. The danger does not come from the tents; it comes from overcrowding your sewerage system. We have had one suit for damages from Fort Worth from a septic tank that was not in good shape, and there is also danger now to health in the summer when the fly season is on.

The CHAIRMAN. In how many of these camps does the overcrowding occur?

Col. EDGAR. In all camps in the South there has been more or less overcrowding. The worst case I know of is at Camp Kelly No. 2, built to accommodate 2,100, and they had up to 4,700.

The CHAIRMAN. Did you record any protest?

Col. EDGAR. Yes, sir; I have filed repeated protests.

The CHAIRMAN. Was anything done to rectify it? In other words, were your protests heeded at all?

Col. EDGAR. Not yet.

The CHAIRMAN. When did you make the first one?

Col. EDGAR. In January.

The CHAIRMAN. Since making the first protest did this condition continue there or in other places?

Col. EDGAR. It has continued, and camps are breaking out first in one place and then in another.

The CHAIRMAN. Colonel, does not that tend also to interfere very largely with the proper training of the men for whom these camps are instituted?

Col. EDGAR. There have been some board meetings on the subject. The overcrowding, it is claimed, is done for the purpose of furnishing enough personnel for training purposes. The overcrowding, it seems to me, comes in a sort of progression—first an excessive number of planes on the field and then an excessive number of enlisted men to take care of them, and then more cadets.

The CHAIRMAN. Does that not break up and interfere with the whole program, as you outlined it, for the proper training and furnishing of men for our Aviation Service?

Col. EDGAR. I should think it would. I am not, of course, running that side of it; all we are doing is to try to guard these men's health and keep these camps so our health record will keep up. You have undoubtedly read in the record of only 4 per cent sickness in the camps we built, against 8 per cent for the Army.

The CHAIRMAN. No; I have not.

Col. EDGAR. And we have spent money; we have been criticized for spending it very freely on building these buildings, putting in proper washrooms, and putting in toilet facilities and various other things; but our health record has been very high, and I have been very jealous of it and have wanted to guard it, and this overcrowded condition is a very serious condition.

Senator SMITH of Georgia. The remedy would be to either have less men or build more camps, I suppose.

Col. EDGAR. Yes.

Senator REED. You can answer thus far for the record, that if the Government is to continue to train as many men as it is now training, then either the present fields ought to be enlarged or new fields opened, or both.

Col. EDGAR. The present fields should not be enlarged. New fields should be opened.

Senator FRELINGHUYSEN. Was your protest verbal or written?

Col. EDGAR. Both.

Senator FRELINGHUYSEN. Have you a copy of your protest?

Col. EDGAR. I can get it for you; yes.

Senator FRELINGHUYSEN. I would suggest, Mr. Chairman, that it should be submitted for the record.

The CHAIRMAN. Yes.

Senator REED. Who did you protest to verbally?

Col. EDGAR. To Gen. Squier and Gen. Kinley.

Senator REED. When, approximately?

Col. EDGAR. It is just approximate. I have been protesting since January.

Senator REED. Repeatedly.

Col. EDGAR. Yes, sir.

The CHAIRMAN. Your protests to Gen. Kinley were made after he was put in charge of the division?

Col. EDGAR. Yes, sir.

Senator REED. I should like to follow up this point——

Senator FRELINGHUYSEN. May I ask just one question.

Senator REED. Yes.

Senator FRELINGHUYSEN. Are there any hospitals at or near these camps?

Col. EDGAR. There is a hospital building at each of the camps.

Senator FRELINGHUYSEN. Under whose supervision are they?

Col. EDGAR. Under the supervision of the medical section of the Aviation Corps. The Surgeon General has a surgeon detailed to the Medical Corps. The organization works through him.

Senator FRELINGHUYSEN. They are under the Surgeon General, too?

Col. EDGAR. Yes.

Senator FRELINGHUYSEN. Have you protested to the Surgeon General?

Col. EDGAR. No, sir; I have only submitted to the Medical Corps the list of these fields with the camps that were built there.

Senator SMITH of Georgia. You would not be justified in carrying your protests to the Surgeon General.

Col. EDGAR. I would have to submit it to The Adjutant General or to the Chief Signal Officer. I have handed to the Surgeon General a list of these fields, with the capacity of them, to do as he pleased with them.

Senator REED. You told us of the contractor that had been employed building the three fields in Texas.

Col. EDGAR. Three fields at Fort Worth.

Senator REED. They were built by this man whose name you put in the record, and you say his work was satisfactory. There was no evidence of anything wrong about it?

Col. EDGAR. No, sir.

Senator REED. But you have no means of separating for the committee the cost of the sewerage and roads and grading and drainage from the cost of the buildings, the actual cost?

Col. EDGAR. No; we have no way of separating it, except as we have done it here.

Senator REED. You had some auditors in there, did you not, keeping accounts?

Col. EDGAR. Oh, yes.

Senator REED. Did not those auditors separate the cost?

Col. EDGAR. No. You see, it is not a question of materials. The material you can keep absolutely; it is a question of the labor, and if an auditor on one of these jobs, which is done in six or eight weeks, attempted to make such a separation and give me the figures they would be such figures as this, as he made them. A labor gang is working one minute on the fields and the next day or the next half day it may be on something else.

Senator SMITH of Georgia. The overhead is the same.

Col. EDGAR. The overhead is the same.

Senator REED. Who were the contractors on the other? Let us go to Belleville, Ill., who did that work?

Col. EDGAR. That work was done by a St. Louis contractor, the Unit Construction Co., of St. Louis.

Senator REED. Did they build more than that one field?

Col. EDGAR. No, sir.

Senator REED. Was their work satisfactory?

Col. EDGAR. Only fair; there was not anything that could be criticised as very bad, but they did not have a complete organization.

Senator REED. Let us take the next one. The Dallas, Tex., Love Field. Who did that work?

Col. EDGAR. I can not remember that offhand. I think that work was done by a contractor from Dallas.

Senator REED. Do you know whether he did any other work than just the one field?

Col. EDGAR. No; he just did that field, that one contract.

Senator REED. How is their work—satisfactory?

Col. EDGAR. Yes, sir; very. I tried to get the man in the service after the job was over.

Senator REED. You will put his name in the record?

Col. EDGAR. Yes, sir; on each one of these, sir.

The man referred to is Mr. W. H. Hedrick.

Senator REED. Coming to the next one, the Dallas, Tex., repair depot, who built that?

Col. EDGAR. That was built by the same contractor that built the Dallas field. They are right alongside each other.

Senator REED. Both done at the same time?

Col. EDGAR. Yes, sir.

Senator REED. The next is Dayton, Ohio. Who built that?

Col. EDGAR. The Dayton Lumber Co.

Senator REED. It was a Dayton concern?

Col. EDGAR. Yes, sir.

Senator REED. Was their work satisfactory?

Col. EDGAR. Only fair.

Senator REED. Was there any evidence of an attempt to employ a lot of people and swell the cost?

Col. EDGAR. I would not say that. That contractor, the man who ran the outfit, was named King. He was not a high-class contractor; he did not have a good organization; and I was very glad when we came to the Fairfield warehouse to not have him. King built the McCook Field and Wilbur Wright Field.

Senator REED. He built both of those?

Col. EDGAR. He built both of those, but he did not build the warehouse. We switched to Frank Hill Smith there.

Senator REED. How was King selected?

Col. EDGAR. King was selected by the recommendation of Col. Deeds to me and submitted to Col. Starrett.

Senator REED. Col. Deeds recommended him not only for the—

Col. EDGAR. He was recommended for Wilbur Wright Field, and he was then recommended for the McCook Field after the Wilbur Wright Field. The Wilbur Wright job was not quite completed when the McCook was started. That McCook job, you know, we did not pick out that field. That field was picked out by the production end, the equipment division. It is a field for testing—a test field.

Senator REED. Who recommended that?

Col. EDGAR. Col. Deeds—Waldron, Col. Montgomery.

Senator REED. Let me get this right. King, the contractor you referred to as King, built the Dayton Field.

Col. EDGAR. The Wilbur Wright and the McCook Fields.

Senator REED. The Wilbur Wright and the McCook Fields; but he did not build the warehouse.

Col. EDGAR. No, sir.

Senator REED. And in these cases he was recommended by Col. Deeds?

Col. EDGAR. By Col. Deeds; yes, sir.

Senator REED. Was King an incorporated company?

Col. EDGAR. Yes; the Dayton Lumber Co. is the name of the concern.

Senator REED. You have copies of that contract, have you not?

Col. EDGAR. Oh, yes; of all contracts?

Senator REED. Of all these contracts?

Col. EDGAR. Yes, sir.

Senator REED. Do you know who constituted this Dayton Lumber Co.?

Col. EDGAR. No; the only individual that I know in it is Mr. King, the president of it. You see, I was not on the job; I was out there a couple of times going over it, but I was not there with the job.

Senator REED. You say one of these—the McCook Field—was chosen——

Col. EDGAR. Was chosen by the equipment division.

Senator REED. And the other field?

Col. EDGAR. The Wilbur Wright Field.

Senator REED. That Wilbur Wright Field you chose?

Col. EDGAR. I chose it with Gen. Foulois; yes, sir.

Senator REED. What was the real trouble with the King Co.? I will call it the King Co. for convenience, for the record.

Col. EDGAR. He was not big enough for the job; he did not have the organization. The men he put on the job were not the best type of men. I had to put on more engineers than was really necessary on that job to see that it went through, and as time went on we had to put more and more auditors on the job. He did not seem to have enough funds to pay his bills. He wrote letters to people that he was not getting his bills paid by the Government, and therefore he could not pay for pipe or lumber and things, and generally we had a mess with him.

Senator REED. When you came to building the large field, the Wilbur Wright Field——

Col. EDGAR. The Wilbur Wright Field is the big one; that was the first one.

Senator REED. Did King build that?

Col. EDGAR. Yes, sir.

Senator REED. Then he built the McCook Field?

Col. EDGAR. Yes, sir.

Senator REED. Then you came to build the supply depot—is that what you call it?

Col. EDGAR. Yes, sir.

Senator REED. He did not get that contract?

Col. EDGAR. He did not get that contract.

Senator REED. Who did that?

Col. EDGAR. Frank Hill Smith.

Senator REED. Was he a Dayton concern?

Col. EDGAR. A Dayton contractor; yes sir.

Senator REED. Did you find his work more satisfactory?

Col. EDGAR. Yes, sir; very much so.

Senator REED. Did he have better organization?

Col. EDGAR. Very much.

Senator REED. Were there other firms there? Did you learn whether there were other firms in Dayton that probably would have done better work than King—better equipped?

Col. EDGAR. I never have looked into this contract proposition; it has gone through Maj. Sterrett's office—only I felt I wanted to know the men I was doing business with—and I could not tell you. I do not doubt there are other contractors there.

Senator REED. Let us take the next one as we proceed down here. We get over to Omaha next. That was not a very large job?

Col. EDGAR. That was a small job.

Senator REED. Was that done satisfactorily?

Col. EDGAR. Very satisfactorily.

Senator REED. Who did that—a local man?

Col. EDGAR. Yes; a local man.

Senator REED. You can put his name in if you do not think of it.

Col. EDGAR. Yes; I will put his name in.

The man referred to is Mr. E. A. Wickham.

Senator REED. Fort Sill, Okla.; what is that?

Col. EDGAR. That is a very good job; that was done by contractors doing the cantonment at Camp Devons, and was done at the same time.

Senator REED. Do you remember his name?

Col. EDGAR. No, sir; I would rather put the names in.

The contractor referred to is the Selden Breck Co.

Senator REED. At Fort Sill, Okla.—the balloon school?

Col. EDGAR. That was done by the same contractor.

Senator REED. He was a local man?

Col. EDGAR. No, sir; he was a St. Louis man; he was a St. Louis contractor who had the Camp Devons cantonment at Fort Sill. There is nothing at Fort Sill, you know; it is a little town out in Oklahoma. There was no contractor there.

Senator REED. When I said local I meant some man in some Oklahoma town. This was a St. Louis man who got it?

Col. EDGAR. Yes, sir.

Senator REED. Did that same St. Louis man—or St. Louis concern—build any other plants than those at Fort Sill?

Col. EDGAR. No, sir.

Senator REED. At Fort Worth, Tex., here are camps 1, 2, and 3.

Col. EDGAR. The same contractor and the target range—the same contractor had all that work. He did very well.

Senator REED. Was he a local man?

Col. EDGAR. No, sir; I think that was the Gilsonite Co., of St. Louis, but I am not positive of it.

Senator REED. I am glad to find this out. These St. Louis men have been telling me they did not get anything.

Col. EDGAR. They have been getting theirs, all right.

Senator REED. Was that satisfactory?

Col. EDGAR. Yes, sir. That was a fine job, and the last one we were able to save on. There was about \$50,000 of saving, because we had

been over the job twice, and used the same organization—put all the material on the ground, as I told you, and then started to build, and it went fine; it was good weather; we had every advantage.

Senator REED. The next is Langley Field, Va.

Col. EDGAR. That contract was let to the J. G. White Co.

Senator REED. Which ones of these have been unsatisfactory? I want to abbreviate this, to cut the corner.

Col. EDGAR. I will try to help you. I know what you are getting at. The Langley Field job—we have had trouble with the J. G. White Co.

Senator REED. Where were they from?

Col. EDGAR. New York City.

Senator REED. What was the character of your trouble?

Col. EDGAR. Lack of organization. The Langley Field job we have had trouble with from the start; it was started by an Army officer, Maj. Steger, and he had an assistant, Capt. Sloan, down there before I got into this construction work at all; the contract was let and the work started out, and after they had been going for a while it was going badly, and it was turned over to us to straighten it out, and I sent Maj. Waring in there, who had been with Wilbur Wright, at Dayton, and we had to have a complete reorganization. It was not only the White organization that was wrong, it was the organization on the field that was wrong; it was a weak field organization.

Senator REED. Did the Government lose any money, particularly on that?

Col. EDGAR. I think more money was spent down there than was necessary; yes.

Senator REED. How much?

Col. EDGAR. I could not guess at it offhand.

Senator REED. Can you give us an approximation of it?

Col. EDGAR. I will try to get it for you.

Senator REED. I wish you would, because there is going to be a sharp question arise of what became of the money.

Col. EDGAR. The amount was \$640,000. Morrison, Va., and here is J. G. White in there; they did a beautiful job, and did two beautiful jobs at Arcadia, Fla., and out of those four jobs Langley Field has been the only one.

Senator REED. How many did they do?

Col. EDGAR. They had four jobs.

Senator REED. Do you know why they were permitted to have four jobs?

Col. EDGAR. They had the job at Langley Field, and the job at Morrison was close to it; they did a very good job at Morrison, and when Maj. Sterrett came around and asked me about using them I told him I thought it would be worth \$50,000 to the Government to use them to complete the work at Arcadia; he said he agreed with me, and he gave them the jobs down there. They had a perfect organization at Morrison; they had to run through the job.

The CHAIRMAN. You were to tell of the jobs which were not satisfactory.

Senator REED. He is also telling the other side. Let me ask you if the contractor comes in, a responsible contractor—is White a responsible man?

Col. EDGAR. Yes.

Senator REED. Who should stand the loss if a loss occurs through incompetency?

Col. EDGAR. I do not think you can put your finger on it. As an engineer, as a construction man, you can go on the job, Senator, and say, "This is an expensive job, this costs lots of money, and here is another job with the same men, and it has not cost as much," but it is a very difficult matter to put your finger on it and say, "Here, somebody has been wasteful."

Senator REED. Was he given these other jobs after he had done this bad piece of work?

Col. EDGAR. This Langley Field job is still going on. It is not cleaned up yet. They are running along in good shape, but when we took hold of it it was very unsatisfactory.

Senator REED. Who selected this contractor?

Col. EDGAR. That contractor was selected by the Aircraft Production Board for the Langley Field job before I came out to the work here.

Senator REED. White is an incorporated company?

Col. EDGAR. Yes; J. G. White is a big incorporated company in New York.

Senator REED. Of course, you do not know their personnel?

Col. EDGAR. Yes; I know J. G. White. They are interested in sugar in Cuba; they have been building all over the world; they had irrigation projects in the West, the Idaho Irrigation Co.

Senator REED. Do you know whether anyone in the Aircraft Production Board is in any way interested in the company?

Col. EDGAR. No; I have not such information.

Lieut. Col. JONES. It might be interesting to hear from Col. Edgar about J. G. White's authorization in connection with the contract that was negotiated, in connection with shipping material to the point of embarkation.

Col. EDGAR. Let us clean this up first.

Lieut. Col. JONES. Excuse me.

Col. EDGAR. That runs over all the jobs that we have had any trouble with.

The CHAIRMAN. Were the others satisfactory?

Col. EDGAR. We found out many things ourselves, Senator; we found out how to organize a job and found out to educate men, and if we were given a bad contractor to-morrow to do one of these jobs I think we could pull the job around into shape ourselves. I think we could take the job over. I am not convinced we could not save the Government a good deal of money with the men we have. We have pulled the best man out of the White company, out of Stone & Webster, and others, out of other contractors.

Senator REED. Why is that not the way to do it?

Col. EDGAR. I think that is the way to do it.

The CHAIRMAN. Do you have the power to do it?

Col. EDGAR. We have not the power to do it.

Senator FRELINGHUYSEN. To go back to this same contracting and constructing company, you checked them up from time to time, did you?

Col. EDGAR. We checked them all the time; we have got auditors in their office right now.

Senator FRELINGHUYSEN. Did Col. Deeds intercede in their behalf in any stage of the proceedings?

Col. EDGAR. No, sir.

Senator FRELINGHUYSEN. Do you believe that any of Col. Deeds's friends or Col. Deeds himself was interested in any way in that contracting and lumber company?

Col. EDGAR. Yes.

Senator FRELINGHUYSEN. Himself?

Col. EDGAR. I do not think so.

Senator FRELINGHUYSEN. His friends?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. His partners?

Col. EDGAR. I have every reason to believe that Mr. Talbott is the monied man behind the Dayton Lumber Co.

The CHAIRMAN. What is his first name?

Col. EDGAR. I do not know, Senator; but there are two of them, a father and son; you have got their names in the record.

Senator FRELINGHUYSEN. They are very closely associated with Col. Deeds?

Col. EDGAR. Of course the Wilbur Wright contract was let in May a year ago, and I did not know anything about Talbott being in there, and did not know until the money commenced getting scarce; then I believe the information came to me that Talbott was getting the money for King.

Senator REED. What was Talbott's connection with Deeds?

Col. EDGAR. Talbott and Deeds were partners, or have been partners. I prefer not to have this in the record, please. I can not give you much information; you gentlemen can surely get it elsewhere.

Senator FRELINGHUYSEN. You believe there is a relationship between Col. Deeds's partners and the Dayton Lumber Co.?

Col. EDGAR. I would like to have it in the record this way: That I believe that Mr. Talbott is a partner in the Dayton Lumber Co., who had the contract for the Wilbur Wright Field, and the contractor was recommended by Col. Deeds.

Senator FRELINGHUYSEN. And the Aircraft Production Board, of which Col. Deeds was chairman, influenced the placing of that contract?

Col. EDGAR. No; I would not like that to go in the record, because I do not know it and do not believe it.

Senator REED. Let me make a suggestion, a kindly suggestion. We are asking the Colonel to say what he believes, and that is hardly fair to the Colonel.

Senator FRELINGHUYSEN. Strike it out—all except the Colonel's answer that he believes. Well, you know, do you not, that Mr. Talbott is connected——

Col. EDGAR. I do not know exactly the difference; you gentlemen do know the difference between what one believes and what one knows. I believe that Talbott got money and helped King out, and I believe they are virtually partners.

Senator REED. Let me ask you this: If in the course of conducting this business, and in the conduct of it, you learned of the fact that Mr. Talbott was financing to some extent, at least, Mr. King?

Col. EDGAR. Yes, sir.

Senator REED. And did you also learn, in the same way, that there was or had been a business connection of some kind between Deeds and Talbott?

Col. EDGAR. Not at the same time I did learn that.

Senator REED. I say did what you learned about the Deeds connection, if there was any, and the Talbott connection—did you learn that in the course of the conduct of this business?

Col. EDGAR. I said that Talbott was connected with King through the conduct of this business and that he was getting money in for Talbott. I do not know that he was a partner; I hardly think he would furnish money if he was not, and if there was any profit I suppose he participated in it; but I have no knowledge of it.

Senator REED. You did not learn the facts about Deeds's connection in the way that we have been referring to; you learned that outside—hearsay?

Col. EDGAR. I learned that from hearsay and from some statements possibly from Dayton people in connection with the Delco Co.

Senator REED. That would be hearsay.

Col. EDGAR. I want to be fair. I want to answer all your questions fairly.

The CHAIRMAN. Do you know anything about the proposed establishment of a night flying route from Dayton to some other point?

Col. EDGAR. Yes, sir; from Dayton to Rantoul, Ill.

The CHAIRMAN. And which was marked by a series of electric lights of different colors?

Col. EDGAR. Yes, sir.

The CHAIRMAN. When was that arrangement made?

Col. EDGAR. That arrangement was made with Carl Fisher.

The CHAIRMAN. That involved the expenditure of a considerable amount of money, did it not?

Col. EDGAR. I rather imagine so; yes.

Lieut. Col. JONES. Forty thousand dollars.

The CHAIRMAN. Who authorized that work to be done?

Col. EDGAR. I do not know. It did not pass through our division.

The CHAIRMAN. Was the course ever used after it was provided for?

Col. EDGAR. I am under the impression that flights have been conducted over the course once or twice at night.

The CHAIRMAN. Would not that naturally and properly come under your division?

Col. EDGAR. Senator, there are many things that naturally and properly would come under my division that have not been under my division. I could name to you building projects and other things that have been done by Signal Corps officers without any authority and without—I say authority, without obeying the order that says that all construction work for the Signal Corps must be done by the construction division.

The CHAIRMAN. Was not this route electrically lighted?

Col. EDGAR. Yes, sir.

The CHAIRMAN. Have you any reason to know who is responsible for planning that?

Col. EDGAR. I think Col. Jones probably knows more about that than I do.

Senator FRELINGHUYSEN. Have you been hampered in any way by interference or any instructions from any other divisions in the doing of your work?

Col. EDGAR. Oh, yes.

Senator FRELINGHUYSEN. What divisions are they?

Col. EDGAR. We have been hampered by our inability at times to get our papers through, to get approvals through. I think there are 12 or 14 moves between starting off an aviation field and getting the papers finally back. We have had a good deal of trouble of that sort.

Senator FRELINGHUYSEN. Who interferes with you principally?

Col. EDGAR. Our relations with the Equipment Division have been our principal source of difficulty.

Senator REED. Who is the head of that?

Col. EDGAR. Mr. W. C. Potter.

The CHAIRMAN. Have you had as much interference since Potter took it?

Col. EDGAR. No, sir.

Senator FRELINGHUYSEN. Is there a lack of system in the Signal Corps?

Col. EDGAR. Yes, sir.

Senator FRELINGHUYSEN. Is it improving?

Col. EDGAR. I have not seen any improvement.

(Whereupon, at 12.30 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same day.)

AFTER RECESS.

The committee met at 2.30 o'clock p. m., pursuant to recess.

Present: Senator Thomas (chairman) and Senator Smith.

STATEMENT OF COL. C. G. EDGAR—Resumed.

Senator SMITH. In reference to the Americus site, you mentioned that Capt. Grace, who owned the land, was connected with aviation.

Col. EDGAR. Yes, sir. Capt. Grace is a captain in the Signal Corps. He is connected with the firm of Grace & Co., shippers, of New York City. He owned this farm as an estate, and was reluctant to sell. Arrangements were finally made through the city of Americus, the chamber of commerce, for the rental of the land to the Government, with an option price. The city of Americus absorbed the difference between the price the Government were willing to pay and the price demanded by Capt. Grace.

Senator SMITH. In point of fact, he did not seek to sell it?

Col. EDGAR. In point of fact, Capt. Grace disliked exceedingly to part with his land, as we took the choicest piece of his entire plantation.

Senator SMITH. Did the city of Americus offer you other tracts first?

Col. EDGAR. Yes; the city of Americus offered us two or three other tracts. None of them was as desirable from an aviation point of view, on account of the quality of the soil and on account of the grading.

Senator REED. In your judgment, Colonel, was there anything wrong about this transaction?

Col. EDGAR. No, sir. There was nothing wrong about the transaction at all.

Senator REED. I would like to have also as complete a list of aeroplane manufacturers as you could give us outside of those with whom we have contracted, because the question might arise whether or not there are not other factories that could be engaged on these jobs; and, if so, who they are.

Col. EDGAR. I will furnish such a list.

LIST OF AEROPLANE MANUFACTURERS.

Breese Aircraft Co., Farmingdale, Long Island.
 Briggs Airplane Co., Alexandria, Va. (experimental).
 Canadian Aeroplane (Ltd.), Toronto, Ontario.
 Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y.
 Dayton Wright Airplane Co., Dayton, Ohio.
 Engel Aircraft Corporation, Niles, Ohio (spares).
 Fisher Body Corporation, Detroit, Mich.
 Fowler Airplane Corporation, San Francisco, Cal.
 Grand Rapids Airplane Co., Grand Rapids, Mich. (spares).
 L. W. F. Engineering Corporation, College Point, Long Island (experimental).
 Liberty Iron Works, Sacramento, Cal.
 Metz Co., Waltham, Mass. (spares).
 Rubay Co., Cleveland, Ohio (spares).
 Springfield Aircraft Corporation, Springfield, Mass.
 St. Louis Aircraft Corporation, St. Louis, Mo.
 Standard Aircraft Corporation, Elizabeth, N. J.
 Standard Aero Corporation, Elizabeth, N. J. (experimental).
 Sturtevant Aeroplane Co., Boston, Mass. (spares).
 Thomas-Morse Aircraft Corporation, Ithaca, N. Y.
 United States Aircraft Corporation, Redwood City, Cal.
 West Virginia Aircraft Co., Wheeling, W. Va. (spares).
 Wright-Martin Aircraft Corporation, Los Angeles, Cal.
 Lewis Spring & Axle Co., Chelsea, Mich. (spares).
 Hayes-Ionia Co., Grand Rapids, Mich. (spares).
 Wilson Body Co., Bay City, Mich. (spares).
 Ordnance Engineering Corporation, New York City (experimental).
 Glenn L. Martin Co., Cleveland, Ohio (experimental).

Senator REED. Have you been delayed in getting supplies?

Col. EDGAR. In regard to construction supplies, Senator, we have not been delayed. We have had the usual commercial delays and the usual delays in shipping, but we have brought these camps through practically on time in every case. At the start we had our camps ready before there were training planes ready to fill them, and we have kept up to the planes. In fact, in the division of the Signal Corps we led in speed up to probably September, when the personnel section passed us with more flying cadets than our fields would take care of. Up to that time we kept up to the personnel until two or three months ago, when we were ordered to slow down.

Senator REED. Ordered to slow down by whom?

Col. EDGAR. By the control board of the Chief Signal Officer's office, because the combat planes were not getting abroad and there was no reason for excessive haste in building.

The CHAIRMAN. How long ago was that?

Col. EDGAR. About three months ago. That situation lasted for about a month. Then we were told to speed up again.

The CHAIRMAN. Who issued the order? Was that order in writing for you to slow down?

Col. EDGAR. No, sir; I don't think so. I think that was a verbal order from him or from the control board.

The CHAIRMAN. Who transmitted it to you?

Col. EDGAR. Either Col. Arnold or Gen. Salsman; I can not remember which.

The CHAIRMAN. Can not you recall in thinking about it? If you take a moment to think about it, don't you think you can recall?

Col. EDGAR. I will try to go into the records over at the office and get it for you.

The CHAIRMAN. I would like the name of the person who transmitted the order, if in writing. I would like a memorandum of it. You say as you recall now the reason was that our combat planes were not getting into action in Europe and therefore there was no reason for haste here.

Col. EDGAR. Yes; there was an excess of trained flyers.

The CHAIRMAN. If you slowed down in your work, did you gain anything in your work?

Col. EDGAR. Yes, sir; we gained something in cost.

The CHAIRMAN. Did you, in fact, gain anything?

Col. EDGAR. I think I did.

The CHAIRMAN. A material amount?

Col. EDGAR. No; from five to ten thousand on a job.

The CHAIRMAN. It don't amount to much in the end, does it?

Col. EDGAR. No.

The CHAIRMAN. Did you get an order to speed up again six or seven days later?

Col. EDGAR. Yes, sir.

The CHAIRMAN. And in the aggregate you saved nothing?

Col. EDGAR. We saved two or three thousand dollars.

The CHAIRMAN. And delayed the job.

Col. EDGAR. Maybe delayed it a little bit. The difference between speeding up and slowing down in construction is the difference between working overtime and time and a half.

The CHAIRMAN. Then there is some compensation to that. isn't there?

Col. EDGAR. You hold your labor better whenever you give them 10 hours' pay for 9 hours' work.

The CHAIRMAN. Yes; and you get them delivered that much quicker and get the use of your entire investment that much quicker.

Col. EDGAR. Yes, sir.

The CHAIRMAN. It is easy enough to see how it may be economical at times to work on Sunday, because you may have a million-dollar plant tied up for the lack of one Sunday's work.

Col. EDGAR. Yes. The actual fact about Sunday work is this: That the men will work Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday and lay off on Monday, and you only get six days. I discovered that on the first three camps I built, and I have put my foot down on Sunday work, and I have not had it.

The CHAIRMAN. My illustration would apply, perhaps, to the extra hour work.

Col. EDGAR. Yes, sir.

The CHAIRMAN. Now, answering my question as to whether you were delayed in the matter of supplies, you said not in the matter of supplies, and you said that in a way that led me to believe that there might have been some other delay than the one you mentioned.

Col. EDGAR. In November, as I told you this morning, the construction work was appointed to the construction division. The Chief Signal Officer changed the name of our division from construction division to supply division, and one of the jobs of the supply division turned over to me was the furnishing of equipment, furnishing of airplanes, and furnishing of spare parts, and getting supplies for troops going overseas. This was called the matériel section of the air division. There had been a good deal of trouble between the equipment division and the air division in the getting out of these supplies. Possibly as late as December I suddenly became the man between the two grindstones. I had to call on the air division in securing of supplies, and I had to take it up with the equipment division to get them, and there is where the trouble and delay came in.

The CHAIRMAN. You are now the head of the supply division?

Col. EDGAR. Yes, sir.

The CHAIRMAN. That organization now consists of what?

Col. EDGAR. The complete organization appears in the chart which I have furnished the chairman, and it bears its proper title.

Senator REED. Just frankly tell us your troubles there, and then tell us what can be done, if anything, to remedy them.

Col. EDGAR. The matériel section of my division soon after we came over, I discovered, was not getting results, and I found that orders for supplies and equipment were being very badly delayed in the different divisions.

The CHAIRMAN. You are speaking of supplies for the manufacture of the planes themselves?

Col. EDGAR. No, sir; supplies for the aircraft maintenance.

Senator REED. Not the things to make them out of, but the things to go with them.

Col. EDGAR. Yes; so when a plane is smashed we have the parts to fix them up.

The CHAIRMAN. You had trouble in getting them?

Col. EDGAR. Yes.

The CHAIRMAN. Who were you dealing with?

Col. EDGAR. The Air Division, who requisitioned on us for the stuff, and the Equipment Division, who furnished it.

The CHAIRMAN. Who were you dealing with in the Equipment Division?

Col. EDGAR. Colonel Deeds and Col. Waldron just before this time were running the Equipment Division. Col. Deeds was relieved and made industrial executive at headquarters, and Col. Montgomery was in charge of the division. I think Mr. Potter had just come in at this time.

The CHAIRMAN. And Col. Deeds went out. I want to divide your answer into two sections. I would like to have your troubles separated; that is, those that occurred under each one of these men—under Col. Deeds and under whoever succeeded him.

Col. EDGAR. It would be very difficult to divide the troubles, because they were continuous up to a matter of 60 days ago.

Senator REED. Col. Deeds was in first. How long did he stay in?

Col. EDGAR. Until some time around the first of the year.

Senator REED. Tell us what were your troubles at that period.

Col. EDGAR. The trouble was that the Equipment Division did not function. We put orders with them and they did not fill them.

Senator REED. Can you be more specific in your answer?

Col. EDGAR. Yes. I will read you a letter to the Chief of the Signal Corps that I wrote to him on the 24th day of January, which I think covers the situation as I found it. On January 24 I sent this memorandum in:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, January 24, 1918.

Memorandum for Chief Signal Officer:

1. Despite my very short acquaintance with the material distribution work it has become increasingly evident that a most serious situation has developed in connection with the shortage of planes, of engines, and of spare parts for aviation fields. Reports received from the air division seem to point to a greatly restricted training capacity unless some very radical action is taken to supply the full quota of training planes at the southern fields, to supply an adequate number of spare engines for replacement at these fields, to supply a sufficient number of spare parts for engines and planes at these fields.

2. In connection with the above a requisition for spare parts was taken at random and traced up through the equipment division. The requisition is dated December 3 and was filed with the equipment division on December 11 for supplies at Park Field, Millington, Tenn. Out of a total of 97 items, the total shipments to date are 6 thrust bearings. One item, 12 radial thrust bearings, was not understood, and no effort has been made to secure the necessary information and placing of order for these parts, as far as we have been able to learn. One item, cam shafts, purchase request was placed on December 26—two weeks after requisition reached the equipment division, and the crank shafts were finally ordered on January 6, 11 days later. Two items, 1,000 feet of primary cable and 1,000 feet of secondary cable, purchase request was made out on December 21, material not yet ordered. One item, 25 platinum points for breakers, purchase request was not made out until January 12, material ordered January 18. Item 7, friction tape, was not ordered until January 23. One item, 20 valve caps, purchase request was not made out until December 28, order was not placed until January 5. One item, 50 feet of rubber hose, no action has yet been taken. One item, 50 clamps for rubber hose, purchase request dated January 22, not yet ordered. One item, 300 exhaust gaskets, no action has yet been taken. One item, 5 gross of hexagon nuts, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{5}{8}$, no action yet taken. One item, 200 piston rings, purchase request not made until December 22, material not ordered until January 5. One item, 200 exhaust-valve springs, purchase request dated December 20, order placed December 28. Two items, 50 intake-valve springs and 50 intake pull-down springs, purchase request not made until December 27, ordered January 7. Eighteen items were ordered by the engine-spares production section on December 10 in connection with a quantity order with the Pittsburgh Model Engineering Co. On December 18 these items were specified against the order for immediate delivery. No deliveries have yet been made. We are informed that three men from the equipment division are at the factory and expect to expedite shipment in the near future. Forty-one items are covered by a purchase request made out on December 29. The order has not been placed yet. We are informed that these supplies were to be furnished by the Curtiss Co., and that their delivery is held up pending adjustment of prices. It is also reported that the Aircraft Board yesterday decided that the order should be placed with the Curtiss Co.; prices to be later arranged.

3. The principal point in this correspondence is that a requisition reaching the equipment division on December 11 is followed up on January 24, and 1 single item on the entire list of 97 items has been shipped.

(Signed) C. G. EDGAR,
Colonel, Signal Corps.

JANUARY 24, 1918.

Memorandum for Col. Edgar:

1. Referring to attached memorandum regarding spare parts for OX5 engines, the writer secured a list of spare parts that were asked for by the air division

on December 3. It was forwarded to the material section, where a memorandum was attached and sent to the engine spares section on December 11.

2. The seeming delay of 8 days in the material section was accounted for by the fact that they did not believe they received the list the day it was dated—i. e., December 3—but that it was held up in the air division before being sent to the material section.

3. The engine spare production section received the list on December 11, and the action they have taken on the various items is attached hereto. They claim that when a purchase request is made out of them the matter is out of their hands.

4. The purchase request, which is made out by the engine spare production section, is forwarded to the purchasing supply department, where order has to be issued. The main delay seems to be in that department, owing to the fact that they must advertise for bids, adjust prices, etc.

5. When an order is placed by the purchase and supply department the case is then in the hands of the follow-up section, who are supposed to see that prompt shipment is made.

6. Inasmuch as most of these parts must be especially manufactured, it is quite a while from the time the order is placed until the date of shipment. The writer's suggestion would be that an order be given some responsible concern to make up a large amount of OX5 engine parts, shipment to be made from future directions. As the OX5 is the standard airplane engine, parts will always be in demand and a similar delay in the future will be obviated.

W. H. FITZPATRICK,
2nd Lieut. Sig. R. C. A. S.

Senator REED. You say "despite your very short connection with this branch."

Col. EDGAR. Yes, sir.

Senator REED. When had your connection begun?

Col. EDGAR. In December.

Senator REED. When did you file that letter?

Col. EDGAR. That was filed with the Chief Signal Officer on the 24th of January.

Senator REED. Your letter, of course, was reciting a lot of troubles you had had, but I take it the letter did not cover all the things that you had ordered. You had ordered many more things than that.

Col. EDGAR. I just took one order that went through for one day, as an example, and sent it through to see what would happen.

Senator REED. You had sent in many orders every day, I suppose.

Col. EDGAR. Yes, sir; every day.

Senator REED. Some go through every day, and you had been in there for some weeks and you had gotten attention to some things and no attention or poor attention as to the others. Now, this letter which you have read is not a letter that collates all your troubles out of all these orders, but it is a sample of a day's work?

Col. EDGAR. Yes, sir.

Senator REED. Do you think it a fair sample of all the days?

Col. EDGAR. At that time; yes.

Senator REED. So the treatment of your orders, as set forth in this letter for this one day's orders, would probably furnish a very fair index to the whole management up to that time?

Col. EDGAR. I will answer that by saying that I think this is the average.

Senator REED. Would you say it is typical?

Col. EDGAR. Senator, you are making it stronger than I want to say. Some of them were faster than others, and some were slower;

but I just took a bunch and pulled out one and said, "Take this order."

Senator REED. Who was it?

Col. EDGAR. Lieut. Fitzpatrick; he went through the equipment division and made me this memorandum of the way an order was handled over there, and this letter, in my opinion, did more than any of the kicks on what orders we did not get to make a change over there.

The memorandum is as follows:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, December 25, 1918.

Memorandum for Col. Edgar.

1. This is an endeavor to give you a brief outline of the history of a requisition from the time it is received by the matériel section of the Supply Division.

2. The Equipment Division is divided into eight sections, in so far as I have been able to find out, which pertain to aeroplane parts, namely, the engine production section, the engine spares production section, the plane production section, the wood section, the spruce conservation section, the electrical engineering section, the airplane linen and dope section, the ordnance and instrument section. A requisition that we receive contains various items which we are supposed to separate and ascertain to which section a memorandum should be sent. We send the memorandum to the section the article calls for, and it is supposedly out of our hands. On each memorandum is noted, "Please advise us what action is taken on this matter."

3. The section to which we send the memorandum is supposed to initiate the purchase request. The purchase request is then sent to the planning section, who send it to the War Clearance Board. After its approval by the War Clearance Board, it is returned to the planning section, who in turn forward it to Col. Seonne for his approval. From Col. Seonne's office the purchase request goes to the appropriation section, where they decide whether or not there are funds available. If such is the case, the supply production section receives the purchase request. They pass on it and hand it over to the quotation section for them to get the best price possible. After the quotation section has advertised for bids the purchase request, together with the report of the quotation section, goes to the contract section, who are supposed to place the order. After the order is placed, the follow-up section has the matter entirely in their hands and it is up to them to see that the material reaches its destination.

4. From this you can see that after we forward a memorandum to the section of the equipment division it is supposedly out of our hands, and that it is their lookout to see that the proper action is taken.

W. H. FITZPATRICK, Jr.,
Second Lieut. Sig. R. C. A. S.

That letter I used in a meeting with Col. Montgomery, Mr. Potter, who had just arrived, and I showed it to Gen. Squier and told them it was an impossible situation.

Senator REED. Who got up that scheme?

Senator SMITH of Georgia. That scheme of organization?

Col. EDGAR. I could not answer that question, Senator; I do not know. It is some system.

Senator REED. Where was this young lieutenant when he made this discovery?

Col. EDGAR. He was detailed to me as a liaison officer.

Senator REED. Where was this?

Col. EDGAR. He went over to the equipment division and took one of our requisitions.

Senator REED. Who was the head of the equipment division?

Col. EDGAR. I think Cols. Montgomery and Deeds, on the 24th and 25th of December.

Senator REED. So that it is fair to say that if they did not create they at least tolerated this condition, because it existed while they were there?

Col. EDGAR. Yes; it existed while they were there?

Senator REED. Do you know how long that system had existed?

Col. EDGAR. No, sir.

Senator REED. Do you think this young gentleman—I say “young”—is he a young man?

Col. EDGAR. Yes; he is a young man.

Senator REED. Do you think he probably learned—do you think we could find out by asking him how long this system had been in vogue?

Col. EDGAR. No, sir. He was sent over there evidently on the 22d or 23d of December and he made this report to me on Christmas Day. He just took a piece of paper with an order.

Senator SMITH of Georgia. You sent him there to find out, if possible, the cause of the delay?

Col. EDGAR. I sent him there because we were having delays, and I wanted to know what happened to a piece of paper that went into their equipment division, and he followed it through.

The CHAIRMAN. Let me again ask you, if it is appropriate, whether your letter of the 24th and your reference to this report of the lieutenant at the meeting to which you refer, brought about any change for the better?

Col. EDGAR. Yes, sir; I think under Mr. Potter's management there has been a decided change for the better.

The CHAIRMAN. Was there any change before Mr. Potter went in there for the better?

Col. EDGAR. Not that I know of. I do not know of any change until this was taken up. On the 24th of January, after putting this letter of Fitzpatrick's again before Gen. Squier with my report of January 24, Mr. Howard Coffin was called in, and Mr. Coffin and I went down to the equipment division to notify them that an impossible situation had arisen and that something must be done, and we succeeded in getting authority for the local purchase of not over \$300 a day at each one of these fields from local hardware stores and other places to get these fields in operation. We were shy monkey wrenches and screw drivers, rubber hose, clamps, such stuff as could be bought in any hardware or bicycle store.

The CHAIRMAN. Was that limitation sufficiently liberal to serve its purpose?

Col. EDGAR. It was sufficient to serve the purpose, and was continued for some time. I have threatened at times to withdraw it, because I think possibly at times it may have been abused. It is still in existence. The commanding officer, whose supplies do not get there, has the right up to \$300 a day to go downtown and buy to keep his planes in the air.

The CHAIRMAN. You think some of your difficulties, at least, have been done away with by Mr. Potter?

Col. EDGAR. Yes, sir; I think Messrs. Potter, Fletcher, and Kellogg have made some improvements over there.

Senator REED. You say some improvements. Colonel, we do not ask you to criticize anybody; but can you tell us now what ought to

be done, in your judgment? How can this be handled with safety to the Government? What kind of plan can be evolved so the Government has a reasonable check on supplies—on purchases—and at the same time we do not have to wait days and days in delaying important matters?

Col. EDGAR. Senator, I can not pass on the interior structure of the equipment division; I have never been associated with it. I have been—just as I have pointed out to you—between these two grindstones.

Senator REED. I am not asking you what they should do, but what kind of system could be devised, in your judgment, to obviate these delays and be safe to the Government?

Col. EDGAR. I do not think that, under the system they have there, there should be these delays; I do not think it was a delay after Potter changed this purchasing system that went around in circles. I think it has been simply a lack of functioning over there.

Senator REED. Let me ask you this: At a time like this, when it is necessary to have these supplies, what is the reason that the man in command may not be vested with a wide discretion—the man in command of a purchasing-supply division, for instance, should not be vested with a wide discretion to go right into the market and buy whatever he needs and get it?

Col. EDGAR. He should.

Senator REED. Without any circumlocution or fooling about it; and why should he not have at hand men sufficiently advised with reference to the necessities of things so they could, if any check is necessary upon any officer in a camp, constitute that check?

Col. EDGAR. Senator, we are making that check. When we send them an order, it goes over my signature; it has been passed on by men who know what should be gotten. All they have to do is to buy it and deliver it.

Senator REED. All you need, then, is just a good purchasing agent with a few clerks to carry out his orders.

The CHAIRMAN. Would not that minimize the expense enormously in doing away with these bureaus and divisions and clerks?

Col. EDGAR. Yes; I think it would minimize the expense. I think you might pay a little more here and there for articles, but it would reduce your overhead enormously.

The CHAIRMAN. That is what my question had reference to—the overhead.

Senator REED. I do not know any reason why you should pay more if you get a competent man, with some efficient help around him. For instance, it may be of little value here in the record, but I have in mind a city that was robbed and plundered through boards and all sorts of things, not so much dishonesty as incompetency, and finally they hit upon the plan of hiring a man called the "purchasing agent," and they said to him, "Go out and make the best bargains you can for the city," and they saved thousands of dollars and got goods promptly. Everybody was there every morning at the office of this purchasing agent ready to display their goods and fill orders.

Col. EDGAR. Of course, in this construction work I have had to do a lot of buying. We have had to buy various things. We had to buy stoves last summer in a most difficult situation, when the United

States Government wanted more stoves than the entire output of the country. We went into the market and got our stoves. We had to pay in one or two cases a little more than the quartermaster; in other cases we bought them for less than the quartermaster. But it was done.

Senator REED. Since the 24th of January, when you wrote this letter, sharply calling attention to the situation, you say you think there have been some modifications, yet I take it from something you said the materials do not come on as they should.

Col. EDGAR. Yes, sir; our materials are now coming on, but it was not immediate. This is May; that was January. We are getting on, we are getting materials; orders that were placed sometime ago are being filled now and the work is catching up. We have had a large number of planes; some aeroplanes we have had to break up at the field in order to get spares. The basic trouble with this situation was when these gentlemen came down here the first thing we were short of was training planes. We built a field and did not have training planes, and everybody rushed to get training planes and did not order spares. When the training planes came, though, and the spares did not come through, we agreed that when you have plenty of planes the thing to do was to break your planes up and make spares of them. We had at one time to take a whole bunch of planes coming without any engines in them and made wing spares out of them, and landing-gear spares, in order to keep things going. Now, these spare parts have been ordered and are coming through; now, our training planes are coming through in volume, and everything is pressed on combat planes, and some day we will have a tremendous cloud of combat planes coming through, just as we had the training planes.

Senator REED. But I understand that you said awhile ago that at the present time it was not so much a matter of bad system as the fact they were not functioning.

Col. EDGAR. Yes.

Senator REED. When you say they are not functioning, what do you mean by that?

Col. EDGAR. I mean the men put here to do these things did not do it in these divisions.

Senator REED. Are they doing it now?

Col. EDGAR. I think they are; yes, sir.

Senator REED. So you think that difficulty has been largely wiped out?

Col. EDGAR. I think that difficulty has been largely wiped out.

Senator REED. That has been wiped out within what period of time and under what management?

Col. EDGAR. Under the Potter management, since he has been in there.

Senator REED. Do you have any reason to believe now—I am not asking you for a mere opinion—but if you have any fact leading you to believe that there was any intentional delay in furnishing supplies?

Col. EDGAR. I have no such information.

Senator REED. So far as you know, as far as you do have information, it only indicates stupidity or carelessness?

Senator SMITH of Georgia. Or lack of force?

Col. EDGAR. Interior friction, Senator.

Senator REED. Do you know of any interior friction?

Col. EDGAR. I could not put my finger on it and say this man is fighting with that man, but from the way things come through it is evident to me as a business man that there must have been interior friction in the organization or it would not have happened.

Senator REED. Do you know of any special delays occurring in that class of supplies which had to come from the Curtiss plant?

Col. EDGAR. Yes; supplies of spare parts for aeroplanes.

Senator REED. From the Curtiss plant?

Col. EDGAR. From the Curtiss plant; yes. The Curtiss plant makes the J. N. 4 training plane, and on spares for J. N. 4's we were very short for a while, and these, as cited in this letter, were placed with the Curtiss Co., and the delay, as cited here, on the question of price. There was infinite discussion about what we were going to pay for these spares, and while the discussion was going on we were waiting at the field.

Senator REED. How many men were probably held up by reason of that delay?

Col. EDGAR. I could not tell you.

Senator REED. Not approximately?

Col. EDGAR. No, sir.

Senator REED. You do not know how many machines that laid up, do you?

Col. EDGAR. No, sir; I do not. I have not that information, but it would be an easy matter to take the statement, which is published every week, of the number of planes in commission and the number out of commission, the percentage; you can get those from the air division running back over six months.

The CHAIRMAN. That is, do you have reference to training planes or airplanes? Do those reports of which you speak include anything more than training planes?

Col. EDGAR. No, sir; they are the school operation reports; they are made up in the air division; they show the number of planes on hand at each school, the number smashed each week, the number on hand at the close of the week; the number of planes received; and the number of planes repaired and put back in commission.

Senator REED. Could you make an estimate of the delay which occurred?

Col. EDGAR. Senator, I am not in a position to do that. It is a matter for the training section of the air division to do.

Senator REED. I am trying to avoid the very thing that they had over there, dividing this work up so much that you will never get it done.

Col. EDGAR. I will get it for you, if that is what you want, but I could not make it myself.

Senator REED. That is the statement showing the amount of delay?

Col. EDGAR. Due to shortage of spare parts during this last winter's work.

Senator REED. I should like to have that. That is, due to failures to carry out with a reasonable degree of promptness the orders that were put in.

Senator SMITH of Georgia. But you have finally gotten your men trained away ahead of fighting planes?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. And the real trouble is lack of fighting planes now?

Col. EDGAR. Yes, sir.

Senator REED. Do you know whether they are having the same delay on the fighting plane as they had on the planes you have just been discussing, the training planes?

Col. EDGAR. You mean on spare parts?

Senator REED. Yes.

Col. EDGAR. I am told they have not, but that is hearsay evidence. I have not any information on it. I am told every shipment of planes that goes overseas carries its spare parts with it, and the information I have is 29 shipments, containing 113 plans, has gone over.

Senator SMITH of Georgia. Are those fighting planes?

Col. EDGAR. Yes, sir.

The CHAIRMAN. That is, up to this date?

Col. EDGAR. May 29.

The CHAIRMAN. The information we got the other day from the War Department would indicate it was very much less.

Col. EDGAR. This is the actual amount of shipments we have handled through our traffic department. There has been made from the Dayton Airplane Co. 29 shipments, 113; out of these 113, 105 have reached American ports and have been turned over to the Army Transport Service.

The CHAIRMAN. Are those equipped with the Liberty motor?

Col. EDGAR. I so understand.

The CHAIRMAN. What are they, the De Haviland?

Col. EDGAR. The De Haviland 4; yes.

Senator SMITH of Georgia. Do you handle the export of planes?

Col. EDGAR. I handle the interior, inland traffic of all planes; they are all shipped through Maj. Benton's section of my division.

The CHAIRMAN. Can you tell me how many of those were shipped during the present month?

Col. EDGAR. I can give you the shipment of every day.

The CHAIRMAN. Have you it here?

Col. EDGAR. No, sir.

The CHAIRMAN. Let me call your attention to another matter. Do you know of any work done on the Miami field that was not ordered by you?

Col. EDGAR. Senator, we have had a good deal of difficulty in our work due to the overenthusiasm and overambition on the part of various people. At Miami Mr. Carl Fisher was instructed by somebody to build an aviation field. He went to work and built an aviation field down there, put up aereodromes.

The CHAIRMAN. That was taken up with Col. Deeds, was it not?

Col. EDGAR. That was taken up with Col. Deeds. I believe Col. Deeds assumes all responsibility for it.

The CHAIRMAN. How much money was expended?

Col. EDGAR. Do you know, Col. Jones?

Col. JONES. Yes; \$40,000, in round figures.

Col. EDGAR. I never knew anything about it until I heard from Fisher that additional work ought to be done. I wired him. He said, "I am building you a field."

Col. JONES. The committee might be interested in hearing the story of how that was settled.

Senator REED. Yes; let us have it.

Col. JONES. But I did not mean to take that from you.

Col. EDGAR. You are familiar with that, are you not?

Col. JONES. I happen to be, because you were away on business two or three days, and I settled the matter; that is all.

The CHAIRMAN. I think that is all we care to ask the colonel.

Col. EDGAR. We have had in connection with this unauthorized shipments and work that has been unfortunate, I think. For instance, the Equipment Division has built acetone plants for the manufacture of acetone for making dope for aeroplane wings. They have arranged with the manufacturer to let a contract for the building of the factory.

The CHAIRMAN. Who authorized that work to be done?

Col. EDGAR. That work was done by the Equipment Division, a million-dollar job.

Senator REED. That is Deeds, is it not?

Col. EDGAR. On a \$100,000 job it is 7 per cent.

Senator SMITH of Georgia. Was that before he left the division?

Col. EDGAR. Some were, and some after. This is the 18th of April. This is under Mr. Potter. Here is a million-dollar job that the profit on it is \$100,000; if it had been handled through my division, it would have been done for \$60,000.

The CHAIRMAN. That is on work you have been talking about?

Col. EDGAR. Yes, sir. There have been six or eight of these plants.

Senator REED. Who got the contracts for those?

Col. EDGAR. The Fuller Co. is one of them. I do not know who the other contractors were. The way we had any knowledge of this construction work going on was they got in some difficulty in securing steel, and our relation with the purchasing end of the Government put us in contact with the steel committee, so that they could not get the building steel without coming to us; that is the way we first heard about it. Then they had trouble with traffic. We put traffic officers on these jobs to get the building material in for them; we also criticized their railroad layouts. That is one type of things.

Senator REED. How much of that was done—just those two plants?

Col. EDGAR. No, sir; I think there were about eight of them.

Senator REED. Who built the whole eight—the same company?

Col. EDGAR. No; I do not think so, though I am not sure as to it.

Senator REED. Where can we find out as to it?

Col. EDGAR. You can find out from the Equipment Division. I can get it for you.

WAR DEPARTMENT,
DIVISION OF MILITARY AERONAUTICS,
Washington, D. C., July 16, 1918.

Memorandum for Col. C. G. Edgar:

1. The Signal Corps is now constructing wood reduction plants at the following points: Collinwood, Tenn.; Fremont, Mo.; Kingsport, Tenn.; Lyles, Tenn.; Mechanicsville, N. Y.; Shelby, Ala.; Sutton, W. Va.; Tyrone, Pa.

C. S. BENTON,
Major, Signal Corps.

Senator REED. I wish you would get it for us. I should like to know the total of those figures and whether the Fuller Co. or what company did it?

Col. EDGAR. You want to know the amount of the contract, the contractor, and location of the plant?

Senator REED. Yes; and who let it, who is responsible for it.

Senator SMITH of Georgia. And the percentage of profit.

Col. EDGAR. Yes, sir. There has been another type of construction that has bothered us a very great deal; that is the construction work that has been done by commanding officers of fields without authority from our office. I have two or three different jobs in mind where the commanding officers have gone ahead with post funds that were sent down for maintenance and have built buildings and changed buildings. This sort of thing started very early in our career as the construction division. I started sending out memorandums asking the commanding officer to stop changing buildings and tearing out partitions and using buildings for purposes not intended and building additional buildings, and now the end of the fiscal year is about to arrive on the 1st of July and the property accountant comes in and these things commence to show up. We have one on which about \$186,000 of unauthorized expenses were used down at Ellington Field, at Houston, Tex.

The CHAIRMAN. Was any of that due to overcrowding of these camps, making it necessary?

Col. EDGAR. Yes, sir; some of it due to that and some due to the inexperience of these young commanding officers. We had the experience at Waco of building an officer's club, to accommodate 284 people, and building a commanding officer's house. Another case on Langley Field: Within two weeks an officer went down there and had at the expense of the Government two fireplaces and brick chimneys built in his house.

Senator REED. Is that the list you have there?

Col. EDGAR. No, sir; this is a list of letters sent out to these commanding officers telling them they are not authorized to do such work.

Senator SMITH of Georgia. To whom does such unauthorized work report?

Col. EDGAR. We eventually find out; an officer goes to the field and turns in complaints, and we turn up work we never knew of before.

Senator SMITH of Georgia. Who would approve that?

Col. EDGAR. It has to come through our division and has to have the approval of the Secretary of War.

The CHAIRMAN. How was it paid for?

Col. EDGAR. Out of post funds.

The CHAIRMAN. Designed for other purposes?

Col. EDGAR. Yes, sir.

Senator SMITH of Georgia. Would that not result in losses to the paymaster at the post on his bond?

Col. EDGAR. Yes, sir.

Senator REED. Will you furnish us with as complete a list of that class of expenditure as you can?

Col. EDGAR. Yes, sir; I shall be glad to do that.

The CHAIRMAN. Can you give the names of the fields which have been overcrowded?

Col. EDGAR. Yes, sir; I have a tabulation of them here, with a complete list of the sewerage capacity and the water capacity of each field.

The CHAIRMAN. If you have that you might put it in the record.

Col. EDGAR. Yes, sir; we will be able to put that in the record, showing exactly what each field will hold. In connection with these cases I was just talking about, here is this memorandum:

Present housing capacity and living quarters for enlisted men and officers at all fields.

Location.	Fields.	Officers.	May 11.	Men.	May 8.	Cadets.	May 11.
Arcadia, Fla.	Carlstrom field	73	119	648	897	300	181
Do	Dorr field	73	49	648	761	300	.....
Americus, Ga.	Souther field	73	34	648	759	300	.....
Belleville, Ill.	Scott field	145	73	708	730	300	101
Dallas, Tex.	Love field	109	142	684	961	300	208
Dayton, Ohio	Wilbur Wright	289	263	1,416	2,398	600	98
Fort Worth, Tex.	Taliaferro	109	210	684	1,359	300	202
Do	Barron	109	91	684	1,128	300	188
Do	Carruthers	109	93	684	1,043	300	144
Hampton, Va.	Langley	30	118	900	1,429	.....	.....
Holmwood, La.	Holmwood	219	423	1,366	1,902	600	93
Houston, Tex.	Ellington	219	560	1,366	3,171	600	91
Lonoke, Ark.	Eberts	73	86	648	824	300	96
Millington, Tenn.	Park	109	121	684	1,025	300	201
Mincola, Long Island	Hazelhurst	85	181	912	901	.....	72
Montgomery, Ala.	Taylor	73	63	648	629	300	50
Mount Clements, Mich.	Selfridge	145	116	712	798	300	.....
Rantoul, Ill.	Chanute	145	70	708	611	300	70
Riverside, Cal.	Aviation training camp	73	3	648	150	300	.....
Sacramento, Cal.	do	73	4	648	150	300	.....
San Antonio, Tex.	Brooks	109	120	648	771	300	.....
Do	Kelly, No. 1	109	238	2,628	13,614	.....	.....
Do	Kelly, No. 2	339	149	1,404	2,401	600	726
San Diego, Cal.	Rockwell	.....	206	.....	803	.....	204
Waco, Tex.	Rich field	110	115	708	793	300	214
West Point, Miss.	Payne	73	49	648	750	300	.....
Wichita, Falls	Call	145	93	684	788	300	282
Dayton, Ohio	McCook	1	29	150	235	.....	.....
Lawton, Okla.	Fort Sill	273	527	2,258	1,729	300	.....
Little Silver	Alfred Vail	105	18	450	189	.....	.....
San Antonio, Tex.	John Wis.	32	51	600	1,548	.....	42
Fort Omaha, Nebr.	Balloon school	.....	140	1,074	2,168	.....	136
Garden City, Long Island	Aviation Concen. depot	133	216	3,990	5,355	.....	.....
Morrison, Va.	Aero general supply	25	184	4,164	5,852	.....	.....
Dayton, Ohio	Warehouse	36	27	150	305	.....	.....
Middletown, Pa.	Aviation general supply	24	8	150	198	.....	.....
Richmond, Va.	Aviation warehouse	24	77	150	163	.....	.....
Dallas, Tex.	Aviation repair depot	36	33	608	702	.....	.....
Indianapolis, Ind.	do	36	36	608	681	.....	.....
Montgomery, Ala.	Eng. plane and repair	36	.....	608	.....	.....	.....
Dallas, Tex.	Camp Dick	.....	494	.....	300	.....	993

Housing capacity Signal Corps camps, fields, depots, etc.

AVIATION SECTION.

Location.	Fields.	Present strength.			Housing capacity.			Cadets.	
		Off- cers.	Ca- dets.	Men.	Off- cers.	Ca- dets.	Men.	True ca- pac- ity.	Squads.
Americus, Ga.....	Souther.....	5		600	44	300	600	144	4
Arcadia, Fla.....	Carlstrom.....	126	83	733	44	300	600	144	4
Do.....	Dorr.....	40		459	44	300	600	144	4
Belleville, Ill.....	Scott.....	66	50	571	44	300	600	144	4
Dallas, Tex.....	Love.....	225	223	959	44	300	600	144	4
Dayton, Ohio.....	McCook.....	26		234					
Fairfield, Ohio.....	Wilbur Wright.....	233	74	1,824	88	600	1,200	288	8
Fort Sill, Okla.....	Post Field.....	252	1 285	1,734	44	300	600	144	4
Fort Worth, Tex.....	Taliaferro.....				44	300	600	144	4
Do.....	Barron.....	373	402	3,483	44	300	600	144	4
Do.....	Carruthers.....				44	300	600	144	4
Hampton, Va.....	Langley.....	110		1,436					4
Houston, Tex.....	Ellington.....	519	162	3,006	88	600	1,200	288	8
Lake Charles, La.....	Gerstner.....	325	171	1,866	88	600	1,200	288	8
Lonoke, Ark.....	Eberts.....	83	75	672	44	300	600	144	4
Millington, Tenn.....	Park Field.....	187	194	1,074	44	300	600	144	4
Mineola, L. I.....	Hazelhurst.....	169	57	910	44	300	600	144	4
Mount Clemens, Mich.....	Selfridge.....	95		979	44	300	600	144	4
Montgomery, Ala.....	Taylor.....	55		600	44	300	600	144	4
Rantoul, Ill.....	Chanute.....	63	51	661	44	300	600	144	4
Riverside, Cal.....	March Field.....	1			44	300	600	144	4
San Antonio, Tex.....	Kelly 1 and 2.....	809	630	18,946	2 88	2 600	2 1,200	2 288	1 8
Do.....	Brooks.....	80		775	44	300	600	144	4
San Diego, Cal.....	Rockwell.....	186	204	1,158	44	300	600	144	4
Waco, Tex.....	Rich.....	100	238	707	44	300	600	144	4
West Point, Miss.....	Hayne.....	37		743	44	300	600	144	4
Wichita Falls, Tex.....	Call.....	101	269	838	44	300	600	144	4
Sacramento, Cal.....	Mather.....	2			44	300	600	144	4

1 284 student officers.

2 For Kelly 2 only.

NOTE.—Under heading “Cadets, true capacity,” is the number of cadets that the air division, training section, claim is the limit. All above this number must be housed under canvas or in temporary quarters.

BALLOON SCHOOLS.

Location.	Fields.	Present strength.			Housing capacity.			Com- panies.
		Off- cers.	Cadets.	Men.	Off- cers.	Cadets.	Men.	
Fort Monroe, Va.....		10		221		150		
Fort Omaha, Nebr.....		151	154	2,128	42	200	1,200	5
Post field.....	(See Flying schools)				50	100	50	1
Camp John Wise.....	San Antonio.....	61	77	2,267	36	40	800	2
Balloon detachment.....	do.....							

Schools of military aeronautics.¹

Location.	Fields.	Officers.	Cadets.	Men.
University of Texas.....	Austin.....	24	2 758	5
University of California.....	Berkely.....	12	500	3
University of Illinois.....	Urbana.....	10	478	2
University of Ohio.....	Columbus.....	46	2 712	6
Cornell University.....	Ithaca, N. Y.....	29	496	35
Princeton University.....	Princeton, N. J.....	20	488	29

¹ Some arrangement has been made to house students in university buildings. Only a certain per cent are thus taken care of; exact number not known.

² 101 student officers.

³ 219 student officers.

Schools of military aeronautics—Continued.

SCHOOLS FOR GROUND OFFICER.

Location.	Fields.	Office.	Cadets.	Men.
Georgia Technological.....	Atlanta, Ga.....	25	1 328	.....
University of Ohio.....	Columbus, Ohio ².....	.....	.....	.....
Massachusetts Institute of Technology.	Cambridge, Mass.....	9	1 368	11

¹ 72 student officers.² See schools of military aeronautics.³ 118 student officers.

AVIATION CONCENTRATION CAMPS.

Camp Merritt.....	New Jersey.....	.....	.....	50
Camp Dick.....	Dallas, Tex.....	703	1,618	300
Garden City.....	Long Island, N. Y.....	252	.....	7,161
Camp Sevier.....	Greenville, S. C.....	68	.....	1,083
Morrison.....	Virginia.....	171	.....	5,048

AVIATION MOBILIZATION DEPOTS (RECRUIT DEPOTS).

Detroit, Mich.....	Fort Wayne.....	38	.....	204
San Antonio, Tex.....	Kelly, No. 1 ⁴.....	.....	.....	.....
Waco, Tex.....	Aviation camp.....	300	.....	5,859

⁴ See flying schools.

AVIATION GENERAL SUPPLY DEPOTS.

Fairfield, Ohio.....	.....	16	.....	153
Garden City, Long Island ⁵.....	.....	.....	.....	.....
Middletown, Pa.....	.....	8	.....	197
Morrison, Va. ⁵.....	.....	.....	.....	.....
Richmond, Va.....	.....	7	.....	103

⁵ See aviation concentration camps.

DEPARTMENTAL DEPOT SQUADRONS.

Boston, Mass.....	Department Northeast.....	8	.....	87
New York, N. Y.....	Department East.....	85	1	1,066
Charleston, S. C.....	Department Southeast.....	2	.....	30
Chicago, Ill.....	Department Central.....	5	.....	669
San Antonio, Tex.....	Department South.....	3	.....	23
San Francisco, Cal.....	Department West.....	4	.....	28

MISCELLANEOUS.

Camp Greene, N. C.....	.....	238	.....	7,344
Augusta, Ga.....	Camp Hancock.....	2	.....	119
Vancouver, Wash.....	Vancouver.....	214	.....	12,392
Brooklyn, N. Y.....	Pratt Institute.....	2	.....	240
St. Paul, Minn.....	Aviation Mechanical Training.....	57	.....	2,851
Madison Barracks, N. Y.....	New York.....	2	.....	496
Rochester Aero Photo.....	New York.....	4	.....	747
Little Silver, N. J.....	Alfred Vail.....	18	.....	185
Speedway.....	Indianapolis, Ind.....	33	.....	700
Washington, D. C.....	O. C. S. O.....	593	.....	.....
In transit to camps.....	.....	.....	300	449

NOTE.—Under Miscellaneous above, housing capacity in each case is either not available or personnel is on commutation rations.

Aviation field, concentration camps, and supply depots—Housing capacity in quarters for officer and enlisted man, together with capacity of sewage disposal and water supply plants.

Location.	Fields.	Cadets.		Non-commissioned officers.		Officers.		Men.		Sewage disposal.	Water supply.
		Quarters.	Cadets.	Quarters.	Noncommissioned officers.	Quarters.	Officers.	Quarters.	Men.		
Arcadia, Fla.....	Carlstrom.....	2	300	1	48	2	73	4	600	1,000	2,000
Do.....	Dorr.....	2	300	1	48	2	73	4	600	1,000	2,000
Americus, Ga.....	Souther.....	2	300	1	48	2	73	4	600	1,200	2,000
Belleville, Ill.....	Scott.....	2	300	5	100	7	145	5	608	1,000	1,200
Dallas, Tex.....	Love.....	2	300	4	76	5	109	5	608	1,100	2,000
Dayton, Ohio.....	Wilbur Wright.....	4	600	9	200	13	289	9	1,216	2,300	2,500
Fort Worth, Tex.....	Taliaferro.....	2	300	4	76	5	109	5	608	2,200	2,500
Do.....	Barron.....	2	300	4	76	5	109	5	608	1,800	1,800
Do.....	Carruthers.....	2	300	4	76	5	109	5	608	800	1,500
Hampton, Va.....	Langley.....					1	30	6	900	1,000	2,000
Holmwood, La.....	Gerstner.....	4	600	7	149	11	219	9	1,217	2,000	2,500
Houston, Tex.....	Ellington.....	4	600	7	149	11	219	9	1,217	2,200	2,500
Lonoke, Ark.....	Eberts.....	2	300	1	48	2	73	4	600	1,000	2,500
Millington, Tenn.....	Park.....	2	300	4	76	5	109	5	608	1,000	1,000
Mineola, L. I.....	Hazelhurst.....			1	4	4	85	11	908	1,000	2,000
Montgomery, Ala.....	Taylor.....	2	300	1	48	2	73	4	600	1,000	1,500
Mount Clemens, Mich..	Selfridge.....	2	300	5	100	7	145	5	612	1,200	1,500
Rantoul, Ill.....	Chanute.....	2	300	5	100	7	145	5	612	1,200	1,500
Riverside, Cal.....	Aviation training camp.	2	300	1	48	2	73	4	600	1,200	1,200
Sacramento, Cal.....	do.....	2	300	1	48	2	73	4	600	1,200	1,500
San Antonio, Tex.....	Brooks.....	2	300	1	48	3	146	4	600	1,000	1,200
Do.....	Kelly No. 2.....	4	600	9	196	17	339	9	1,208	15,000	15,000
Do.....	Kelly No. 1.....					5	109	27	2,700	1,200	10,000
San Diego, Cal.....	Rockwell.....									4,000	6,000
Waco, Tex.....	Rich.....	2	300		100	6	110	5	608	1,500	1,500
West Point, Miss.....	Payne.....	2	300	1	48	2	73	4	600	1,200	2,000
Wichita Falls, Tex.....	Call.....	2	300	4	76	7	145	5	608	1,000	1,000
Dayton, Ohio.....	McCook.....					1	1	1	150	200	200
Lawton, Okla.....	Fort Sill.....	3	450	5	100	11	273	14	2,158	3,000	4,000
Little Silver, N. J.....	Camp Alfred Vail.....					3	205	3	450	600	1,000
San Antonio, Tex.....	John Wise.....					1	32	4	600	1,000	1,500
Fort Omaha, Nebr.....	Balloon school.....			1	24			7	1,050	1,200	1,500
Garden City, Long Island.	Aviation concentration depot.			1	15	6	133	27	3,975	5,400	8,000
Morrison, Va.....	Aero concentration supplies.			2	39	2	25	28	4,125	5,000	10,000
Americus, Ga.....	Warehouse.....					1	12	1	150		
Dayton, Ohio.....	do.....					1	36	1	150	400	400
Middletown, Pa.....	Aviation concentration supplies.					1	24	1	150	400	400
Richmond, Va.....	Warehouse.....					1	24	1	150	400	400
Dallas, Tex.....	Aviation repair depot.					1	36	5	608	1,000	1,500
Indianapolis, Ind.....	do.....					1	36	4	606	1,000	1,500
Montgomery, Ala.....	Repair depot.....					1	36	4	150	600	1,000

Senator REED. That is the kind of thing we want in your statement; we want those details so it means something to us.

Col. EDGAR. We will take this statement, Senator, and try to put everything in it that you want.

Senator REED. Have you had any trouble arising from the fact that when you sent a representative to these fields, their orders or advice have been ignored?

Col. EDGAR. These orders have been sent direct to these commanding officers through the Chief Signal Officer.

Col. JONES. I think the Senator means, if you grasp his question, if you sent an engineer down to a field they failed to recognize him and go ahead on their own motion and direct the work he should do.

Col. EDGAR. Yes; if I send an officer down to the field and the commanding officer wants to build something, sometimes he will take my engineer and order him to go ahead and build it. If a first or second lieutenant goes down to a camp commanded by a major, when he goes down there under the military rules he has to obey the orders of his superior officer, although he reports, of course, to me.

Senator REED. Have you had much trouble of that kind?

Col. EDGAR. This work at Ellington field is one of them, I am sorry to say. Part of it was done with troops. This work at Waco was done with construction troops, some of the troops we are supposed to control.

Senator REED. That is the work you have just called attention to, where they built an officers' club, and so forth?

Col. EDGAR. Yes, sir.

Senator REED. I think we ought to have that; it will save us a lot of work. We can ascertain it elsewhere, but we ought to have the names of the commanding officers in each instance at these camps, if you can get that information.

Col. EDGAR. I think we can get it, Senator.

Senator REED. I do not, for my part, think of anything else I want to ask the Colonel, unless he has some message he wants to deliver to us.

Col. EDGAR. The only message I want to deliver is this: I came here to try to help win the war; I have no axes to grind and have not had it in for any person. Everybody has been fine to me here and I have not had friction anywhere with any person.

STATEMENT OF LIEUT. COL. E. LESTER JONES, SIGNAL CORPS, UNITED STATES ARMY.

The CHAIRMAN. Colonel, what is your rank in the Army?

Lieut. Col. JONES. Lieutenant colonel.

The CHAIRMAN. In what department of the service?

Lieut. Col. JONES. In the supply section of what is now known as the Division of Military Aeronautics, formerly the Signal Corps, Aviation Section.

The CHAIRMAN. How long have you been in that branch?

Lieut. Col. JONES. My commission is dated February 28.

The CHAIRMAN. Of this year?

Lieut. Col. JONES. Yes, sir.

The CHAIRMAN. Is that the same division which has been referred to by Col. Edgar as the equipment and supply division?

Lieut. Col. JONES. No, sir; not the equipment, it is known as the material division.

The CHAIRMAN. Are you the chief of that division?

Lieut. Col. JONES. No, sir; I am Col. Edgar's chief assistant.

The CHAIRMAN. Will you please tell us in your own way what you have observed as to the existence or lack of system and coordination in the department to which you have been assigned?

Lieut. Col. JONES. I might cite two concrete cases. One was mentioned this afternoon, but was not gone into in detail. To go back

a bit, when I appeared first before the whole Military Affairs Committee you can recall the reading of a letter by Senator New regarding the aviation field at Miami. At that time I answered it simply by stating that we had no aviation activities in or near Miami, and I spoke with perfect truthfulness, because neither Col. Edgar nor myself had the remotest idea that there was anything of that nature. That stirred up a hornet's nest, first by Mr. Carl Fisher, who I had then never met; in fact, I don't think I ever heard of him before. He wrote and spoke of his field in connection with his estate at Miami. I spoke to Col. Edgar about it, and he said that there had been a great deal of confusion and that he knew very little about it, and that if action had been taken it was contrary to regulations and that somebody acted without authority, which I realized also. He requested that I look into the matter, based on statements that reached me from Mr. Carl Fisher. I wired Mr. Fisher to come on here. He arrived here one morning and I went over the situation at length with him.

Senator REED. Approximately when was this, Colonel?

Lieut. Col. JONES. About six weeks ago, sir. And I found that Col. Deeds some six months ago—that is not the exact date, but approximately—had sent down a civilian, without any status as far as being employed by the Government, to look into this matter.

Senator REED. Do you know his name?

Lieut. Col. JONES. No, sir; I don't recall his name. This man not only went so far as to authorize or accept the use of the land there but authorized the erection of hangars and other buildings necessary for carrying on this small field. Mr. Fisher said, "I acted in good faith, believing that it was a proper authority I was dealing with, and while I do not care anything about the money"—by the way, I believe that is true, because he is a wealthy man. He said, "I am doing it from purely patriotic motives. I feel very indignant that I have been treated in this way and have been at Washington a great many times. There is lack of coordination and much procrastination. I don't know whether they are going to use this field or not." I requested him to give on the proper Federal Government voucher the details of the expense he had been put to. In the meantime, when he left that evening to meet next morning and talk further on this, Col. Deeds heard he was in town and sent for him and asked him what he wanted him for, and he said, "I want to talk to you about this problem," and he said, "I don't feel like coming to you without Col. Jones, as he is the man who has put this matter in shape." So I appeared the next morning with Mr. Fisher, and Col. Deeds started to explain why this thing had been neglected and why it had not been more efficiently handled, and that he wished that the matter would be put in shape, and I told him that had already been done, and he said, "I am to blame for this situation and I am the cause of the trouble," etc. Those were Col. Deeds's own words. Before I left—if I may digress a moment—another matter came up which Mr. Fisher was very much concerned about, and it was the night-flying field from Dayton to Rantoul, about 267 miles.

At each one of these places there is an aviation field and I already have the blue print, the one I have right in front of me now, and I asked Col. Deeds why that had not been utilized; what was the rea-

son, and he said, "That is another matter I have taken up, but for various reasons we have not utilized the route." And I said, "There has been a \$40,000 outlay on this by Mr. Fisher and he has not been reimbursed," and he said, "That is all right," and he further said we ought to use the flying course, and we will use it, because it is very essential that our men should have some night experience in this country if they are going to have it abroad, and "will you see that a voucher is made up for the expense, etc.," I said, "Very good," and I came back to my office and went over this situation. You understand, gentlemen, this whole course is lighted for night flying. On the north are the red lights and on the south the green lights, and the whole course is lighted in these various cities and towns they pass through and he had it so well arranged that in a few hours' notice he could have every one of those lights burning. I said, "Now, Mr. Fisher, you have heard Col. Deeds say that they are going to immediately utilize this course and are going to make it part of the daily work—nightly work. Now, I would like to have you speak to me so I can submit it to Col. Edgar covering the expenses you have been to." It took Mr. Fisher about two and one-half months of his personal work to make this arrangement with the farmers and others in the various towns in reference to the lights. It took about seven months of more or less detail work by stenographers and engineers, etc. Up to date I have not received the voucher from Mr. Fisher. In fact, I have not received a reply to a letter I wrote to him so as to get it in writing asking for an immediate statement from him as to how this money had been expended. Neither do I think they have ever taken very much advantage of the course. As Col. Edgar said, they may have made a few flights, but as far as putting it to proper use. I don't think it has ever been done.

The CHAIRMAN. Is this work which was authorized by Col. Deeds originally and on his own responsibility?

Lieut. Col. JONES. I can not say whether there were any others present.

The CHAIRMAN. I will put the question in another way. Was this work ever authorized by the Division of Supplies?

Lieut. Col. JONES. No, sir. It was never authorized by Col. Edgar. This equipment for this course was never authorized by Col. Edgar. Of course, part of that would not be necessary to be authorized, but where equipment was necessary, why, it would. Matériel, for example, was not authorized by him, because he did not know the details of it, or it would have been brought to his attention.

The CHAIRMAN. Did you first hear of it from Mr. Fisher?

Lieut. Col. JONES. Yes, sir.

The CHAIRMAN. And that was on the occasion of his coming here to look after the Miami matter.

Lieut. Col. JONES. Yes, sir.

The CHAIRMAN. Whatever became of the Miami matter?

Lieut. Col. JONES. In the Miami matter Mr. Fisher submitted a voucher which was satisfactory. At Col. Edgar's request I went up to headquarters and they have arranged to make use of his field very advantageously as an experimental station, where they are away from publicity in using planes and engines, etc., during the experimental stage.

The CHAIRMAN. Was that field authorized by your division?

Lieut. Col. JONES. No, sir.

The CHAIRMAN. What other division has charge of the authorization of fields?

Lieut. Col. JONES. None, sir; and as I remarked some time ago, this all came out and was resurrected, so to speak, months afterwards by this letter, which some of you gentlemen recall as being read by Senator New. I spoke the truth at the moment, but I did find after a few weeks that they did have activities which nobody in supplies knew about.

The CHAIRMAN. In other words, when you appeared before the committee you were ignorant of the work which had been done?

Lieut. Col. JONES. Yes, sir.

The CHAIRMAN. Do you know of any other instance of unauthorized work?

Lieut. Col. JONES. No, sir; I think Col. Edgar has covered the situation. Some of the cases he cited I know of. On account of his having been there longer than I have he is naturally more familiar with the inception of this big program and knows about it much better than I do.

The CHAIRMAN. Did Col. Edgar report to Col. Deeds as a superior in the same line of work or was Col. Edgar superior in rank to Col. Deeds?

Col. EDGAR. Col. Deeds ranked me by four or five months.

Senator SMITH. They are each full colonels?

Lieut. Col. JONES. Yes, sir.

Senator SMITH. The mere matter of dates does not give one the right to rank the other.

Lieut. Col. JONES. No, sir.

The CHAIRMAN. You referred to when Col. Edgar was giving us some information about contracts. There was some incident affecting J. G. Wright & Co. and relating to transportation. What was that?

Lieut. Col. JONES. J. G. White & Co. had a contract with the Government, that was negotiated last September, close to the 1st of October, in which they purchased the material, such as lumber, including spruce and raw materials, such as aluminum and steel tubing, and many other items. They shipped those to the point of embarkation and then charged it to the Government. Where it seemed a great mistake was that west of the Mississippi those land grants of railroads, where a Government bill of lading should have been used, they used commercial bills of lading, and they still do that west of the Mississippi, and we think two or three spurs of the Michigan Central still have some obligation in transporting material and passengers for the Government, but most of it is done west of the Mississippi. J. G. White Co. some time ago were brought to task for not handling these matters by Government bill of lading instead of commercial, as it is very much cheaper, and finally they stopped using the commercial bill of lading on spruce, but everything else still comes from west of the Mississippi on commercial bills of lading still. They charge up the purchase price and the freight which is paid by the Government.

Senator REED. And they get a percentage on the total?

The CHAIRMAN. Do you know what the difference is between the Government and the rate on the railroads?

Lieut. Col. JONES. It is considerable. It is on record, of course. In the first place, it did not seem good business to make any contract. Why could not the Government handle that business direct, and why should they not have used Government bills of lading and settled with the Government direct?

The CHAIRMAN. What disposition was made of that charge?

Lieut. Col. JONES. Through the efforts of Col. Disque and Maj. Benton, pressure was brought on them to use the other bill of lading. That contract was made so long ago that I can not give you it, nor have I a copy of everything. Col. H. H. Putnam, who is now in France, I understand, had the principal part in negotiating the contract. He was formerly a civilian and identified with some big firm.

Senator REED. I don't yet understand what this contract was that White & Co. had. You have spoken about them getting goods over the railroads and not getting them over the land grants on a Government bill of lading. What was their contract? What were they doing?

Lieut. Col. JONES. There were to supply, for instance, over-seas American forces so much spruce, so much hemlock, in all 10 or 12 kinds of wood.

The CHAIRMAN. Did they have a contract with the Government?

Lieut. Col. JONES. Yes, sir. They purchased the material and at the same time paid the freight charges and got a percentage on the total.

Senator REED. I understand that they had a contract to purchase supplies for the Government, and were to be paid a certain percentage on the gross outlay, and a part of that gross outlay was the railroad charges; and if the railroad charges had been less their percentage of profits would have been less?

Lieut. Col. JONES. Yes, sir.

Senator REED. Do you know where that contract is, and can you give us the information as to the amount of goods handled by J. G. White & Co.?

Lieut. Col. JONES. Yes, sir; I can have that statement for you.

Senator REED. I would like to have you show us how much the amount was increased by virtue of the failure to use the Government bill of lading, if you can separate that out from the rest.

Lieut. Col. JONES. That, I should think, would be a little difficult for us to find out, as that comes more under equipment.

Col. EDGAR. Late in May or early in June of last year an order came through from the Secretary of War to ship the material for one complete aviation training camp to France. This included all the supplies for a camp. I made a contract with J. G. White & Co. to assemble this material in New York before shipping. I had to do the purchasing, as I remember, either at 3 or 3½ basis over cost. The work was well done, and I believe that this emergency purchase drew the attention of the equipment division to the facilities of J. G. White & Co. purchasing agents. They have had a contract for the purchase of machinery, tools, materials of various kinds, including spruce, steel bars, aluminum, etc., which is still in existence.

Senator REED. The latter contract being with whom?

Lieut. Col. JONES. The latter contract being with the Equipment Division, and very little other than purchasing activities.

Senator REED. Col. Jones, have you anything further to state?

Lieut. Col. JONES. I don't think I have anything further to say except to bring out the fact from the question which was asked about the contract. I realize that the original was far different from the present contract, but why should this material from the West ever have been shipped by commercial bill of lading?

Senator REED. Do you know of any other contracts with the White Corporation except those which have been mentioned?

Lieut. Col. JONES. No, sir.

Col. EDGAR. There are one or two airplane factories that are interested in the same way.

Senator REED. I wish you would tell us about that.

Col. EDGAR. I can not tell you the full details of it because I don't know. There is one in Massachusetts and one in Michigan, at Grand Rapids, that are the White company's that have contracts for airplanes.

Senator REED. I wonder if you could get us any more accurate information about that.

Col. EDGAR. Yes, sir.

Senator REED. And will you have it within the next day or two?

Col. EDGAR. Yes, sir.

Senator REED. If you don't know the facts to be absolutely true, you can say "my information is to the effect."

Lieut. Col. JONES. Gentlemen, the chairman asked me if I knew of any more irregularities. I can not enlarge on the deficiencies and the amount of procrastination that I observed. I came in there at the request of the War Department, and one thing impressed me so forcibly—I am right in Col. Edgar's immediate office—and that was the trouble that he was continually having by having outside sections or divisions interfering with his functions, and it amazed me, being for some years in the Government, and knowing the manner in which things are handled, I could not quite conceive of a state of affairs ever getting in such a state, and I remarked to Col. Edgar several times that I don't exactly see how a man of your administrative experience stands it. This is an impression which only has the importance that I observed it within a week after being called to the service, a few days later I was called here before the committee, much to my surprise, and I evidenced it then that things did not look right to me. We are coming out of chaos, and a smooth state of affairs will soon come. I think it is too early to tell that, but I hope so.

The CHAIRMAN. The committee will now adjourn.

(Whereupon, at 3.30 o'clock p. m., the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

MONDAY, JUNE 3, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Buffalo, N. Y.

The subcommittee met in the office of the Curtiss Aeroplane & Motor Corporation, 2000 Elmwood Avenue, Buffalo, N. Y., at 10 o'clock a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. B. A. GUY.

The CHAIRMAN. Mr. Guy, what is your connection with the Curtiss Aeroplane & Motor Corporation?

Mr. GUY. I am secretary and assistant general manager. This is our North Elmwood plant. We broke ground here about the 1st of August and finished the plant ready for manufacturing in about 120 days. Mr. Kepperly, our vice president and general manager, is away.

Senator REED. How many plants have you here now?

Mr. GUY. Six; the North Elmwood plant, and then we have the Churchill Street plant and Niagara Street plant and Bradley Street plant and Austin Street plant, and also the South Elmwood plant, which is part of a building across from the Pierce-Arrow plants.

Senator REED. That makes six plants?

Mr. GUY. Yes.

Senator REED. Which was the large plant that you built at the request of the Government?

Mr. GUY. This one.

Senator REED. You call this plant what?

Mr. GUY. North Elmwood, or Plant G.

Senator REED. How much ground does it cover?

Mr. GUY. A little less than 20 acres.

The CHAIRMAN. That includes the yards?

Mr. GUY. That includes the whole project. The main portion of plant is 900 by 1,300 feet.

Senator REED. That is, the building?

Mr. GUY. Yes.

Senator REED. You have 40 acres in the yards, partly used for storage purposes and tracks?

Mr. GUY. Yes; and some of it entirely vacant. The total number of acres covered by buildings is 30.25. Total number of acres in whole plot, 70.426. Total productive area, 1,170,000 square feet. Total area of all buildings, 1,319,880 square feet.

Senator REED. There is room for expansion?

Mr. GUY. Yes. There is a piece that we acquired at the same time that we acquired this other property, but it was really an outlet on a military road back of the plant.

Senator REED. This plant was built since the United States entered the war?

Mr. GUY. Yes.

Senator REED. When did you begin constructing this plant?

Mr. GUY. About the 1st of August, last year.

Senator REED. When did you complete it? If it is not completed, when will you get it ready to go to work?

Mr. GUY. We were operating in the plant 30 days after it was started, but it was ready for manufacturing about the middle of October.

Senator REED. What is the construction?

Mr. GUY. Steelwork, with brick.

Senator REED. Is it fireproof?

Mr. GUY. It is a wood roof, but fireproofed on the outside. It is not absolutely a fireproof building, but it would be a slow-burning building.

Senator FRELINGHUYSEN. Is it equipped with automatic sprinklers?

Mr. GUY. Yes, sir.

The CHAIRMAN. Do you manufacture motors?

Mr. GUY. At our plant at Hammondsport, but not here.

Senator REED. The other five units that you have here had all been constructed before the United States entered the war?

Mr. GUY. Yes, sir.

Senator REED. How many of them were constructed before the European war broke out? What proportion of them was built on account of the European war?

Mr. GUY. Most of our other property is leased. The one building we own is the Churchill Street plant.

Senator REED. I mean constructed or in operation.

Mr. GUY. Five out of the six.

Senator REED. Five out of the six were built or obtained after the European war started?

Mr. GUY. Yes; all of them were built or obtained after the European war started.

Senator REED. Was not Mr. Curtiss making planes before that?

Mr. GUY. Yes; at Hammondsport.

Senator REED. So that this entire plant in Buffalo may be considered to have been constructed because of the European war?

Mr. GUY. Yes, sir.

Senator REED. I take it that from the first you started in with the idea of making a plane to be used either at the war front or in some way to be used in connection with the war, training planes, or something of that sort at this place?

Mr. GUY. Yes, sir.

Senator REED. Outside of the plants in Buffalo, where did you have a plant before the war broke out?

Mr. GUY. Hammondsport.

Senator REED. Have you that plant yet?

Mr. GUY. We have most of it now, and that is being used exclusively now as a motor plant. We are not building any planes in it.

Senator REED. What motor are you making there?

Mr. GUY. A training motor, OX5 used in Signal Corps training planes, and the Curtiss OXX used on the Navy training planes. The Curtiss OX5 is 90 horse, and the Curtiss OXX is 100.

Senator REED. One of those planes is used in the Navy?

Mr. GUY. The motor is used in a training plane known as the N9.

Senator REED. Is that used by the Navy?

Mr. GUY. Yes.

Senator REED. Which is used by the Army, either?

Mr. GUY. The JN4 is the Army plane.

Senator REED. Do you make that?

Mr. GUY. Yes.

Senator REED. Were you making these two motors before we entered the war?

Mr. GUY. Yes.

Senator REED. Mr. Curtiss was making aeroplanes, flying in them, and, of course, had a motor in connection with them.

Mr. GUY. These are all Curtiss designed machines.

Senator REED. And the motors?

Mr. GUY. They were in the N9 planes and JN4 planes.

Senator REED. So I will get this clearly in my mind, you call the flying machine itself the JN4, is that right?

Mr. GUY. JN4 is the type, and of that type we make different models. JN4B was the first training machine that we made. That was purely a Curtiss model, JN4B.

Then the Signal Corps came along with modifications to the JN4B and we made the JN4C. We only built a half a dozen of those because we did not approve of the design. An officer of the Army developed these and the Army did not like them very much.

Senator REED. What date was this?

Mr. GUY. Prior to our going into the war. I could not tell you exactly. Then the English came along and they ordered a type known as the JN4A, which was still further modified from the B, and we furnished in the early part of this year 200 of those to the British, that is, in the fall of 1916 they were ordered, and they were furnished in the early part of 1917. Then the Signal Corps wanted to go back to the JN4B again, or pretty nearly the JN4B, and we told them they could not do that until we could get into that model, but if they wanted training planes they would have to take the JN4A, which was the same type we were building for the British, and so they gave us an order on June 27 of last year for 600 machines.

The CHAIRMAN. What was the date of that order?

Mr. GUY. June 27, 1917.

The CHAIRMAN. That was before you had this plant built?

Mr. GUY. Before this plant was even started?

Senator REED. I guess that is what I have here as June 27 (referring to a memorandum).

Mr. GUY. Yes.

Senator REED (reading). Six hundred JN4B, with engines.

Mr. GUY. Yes, sir.

Senator REED (reading). Price, \$8,000.

Mr. GUY. That is right.

Senator REED. Delivery was commenced when?

Mr. GUY. We delivered, I think, 20 of those machines, or 18 or 20 before the end of the month, before the end of June, and we started delivery immediately upon receipt of the order.

Senator REED. You delivered all those machines, did you not?

Mr. GUY. I can find that out for you.

Senator REED. I wanted to get an outline at the present moment. That is really the first order that you got from the Federal Government after the war started?

Mr. GUY. That was the first quantity order.

Senator REED. Had you received some small orders before that?

Mr. GUY. We received some orders for some R6's or some R9's, which was the type. R6 was a type used by both the Army and Navy, but I can not remember the date of receiving those orders offhand, whether it was after the war started or just prior.

Senator REED. This JN4B that you got the order for 600 for, was a machine that you had to make for the English, and our Government, although they wanted a different type of machine, accepted that one in order to get the machines quickly?

Mr. GUY. They did on that first order.

Senator REED. And they were to be furnished with the machines?

Mr. GUY. Yes.

Senator REED. And the engine which went in those was what?

Mr. GUY. The 90 horse.

Senator REED. What do you call that engine?

Mr. GUY. OX5.

Senator REED. And you have furnished all those 600 engines, have you not?

Mr. GUY. Oh, yes.

Senator REED. Could you tell us offhand when you completed the delivery of the 600?

Mr. GUY. November 21, 1917.

Senator REED. I have here, under a title in a sheet which has been furnished us, "Date delivery commenced," but I think it ought to be "Date delivery completed," September 29, 1917.

Mr. GUY. We commenced delivery in June. We got the order on the 27th.

Senator REED. Just a word about this. How many men do these machines carry?

Mr. GUY. Two men. It is a training machine for the pilot and the pupil.

Senator REED. Is it an advanced or primary machine?

Mr. GUY. A primary training machine.

Senator REED. Both of them; that is, both horsepower engines?

Mr. GUY. Yes.

Senator REED. What is the technical term that you apply to the flying machine outside of the engine?

Mr. GUY. That is an aeroplane.

Senator REED. What do you call the fuselage?

Mr. GUY. The fuselage is the body part of the aeroplane, the same as the body on an automobile.

Senator FRELINGHUYSEN. Where does the Hall-Scott come in?

Mr. GUY. I have never had any experience with that engine.

Senator NEW. It does not figure in this plant at all?

Mr. GUY. We only tried to put a Hall-Scott engine in one JN machine, and that machine was still in the shop the other day and was not completed.

Senator REED. You did not have any trouble then about the plans for these 600 JN4's because you had been making them for the English, and you had your plans and everything complete in your factory at the time our Government put in an order.

Mr. GUY. That is right.

Senator REED. Did you suffer any delays whatever in the getting out of these 600 JN4's, which was your order of approximately June 30, because of any act of the Federal Government?

Mr. GUY. No; no material delays.

Senator REED. Do you know of any delays whatsoever that you suffered?

Mr. GUY. We had minor delays and difficulties in getting shipping instructions when our machines were ready to ship, where to ship them; and it might have resulted in a few days' delay, a week, or something like that, but nothing very serious.

Senator REED. Nothing to complain of and really show that the program had been materially delayed?

Mr. GUY. Not on that 600.

Senator REED. No change in plans?

Mr. GUY. Well——

Senator FRELINGHUYSEN. No delays due to changes in plans or structural delays?

Mr. GUY. No; on these 600 machines we were allowed to make changes in the model to conform with the Signal Corps requirements as we went along. I might say in that connection that if the Curtiss Co. had not anticipated the order that they got on June 27 several months ahead of that date that the Government would never have gotten any machines on the last of June.

Senator REED. Just for the sake of proceeding in order, I wish you would bear in mind anything of that kind, so that we can put it into the record at the proper time. The point I want to get at now is the question of actual delays, and I understand that as far as the 600 JN4's, which were ordered approximately on June 30, is concerned, we may sum that up by saying you had been making that style of plane for the British Government, and therefore had your machine and your plans and all those essentials well in hand, and while our Government authorities wanted a different type of plane they did accept the JN4 and you undertook to get them out 600, and did get them out without any substantial delay being occasioned by any acts of the Army or Navy authorities.

Mr. GUY. Yes, sir.

Senator REED. I understood you were able to go to work on these planes at once. How did you come to have materials on hand and how did you come to be equipped to get them out at once?

Mr. GUY. As far back as February, 1917, various representatives of the Government came out to our plant and talked about large orders for aeroplanes, anywhere from 5,000 to 25,000—just talked—

and these representatives made frequent visits to our plants from February until June and asked us to give them repeated estimates of how we could make deliveries and in what quantities, and we did that. They discussed particularly the motors, as well as the aeroplanes, and we right along were anticipating and hoping and trying to get an order for these machines. In spite of the fact that we did not get an order, we came to the conclusion ourselves that we eventually ought to get an order, and we went ahead and took a gamble and purchased the material and fabricated the parts for over 500 of these aeroplanes without any order on the books whatever.

Senator REED. You say that you fabricated the parts, as I understand; that you had the different parts made ready to be assembled?

Mr. GUY. Yes.

Senator REED. How soon did you begin the work of fabricating those parts—taking a gamble, as you say?

Mr. GUY. We began taking that gamble about the latter part of March or the early part of April.

Senator REED. We went into the war on the 6th of April.

Mr. GUY. We began formulating our plans, getting our figures together, and our quantity requirements together, and it was about the 10th of April that we began placing our orders for this material and manufacturing.

Senator REED. You did not actually have any orders in for materials until after we began the war?

Mr. GUY. I can not say that positively. We may have bought some struts and other things a few days before war was declared. As you remember, war seemed quite imminent before it was actually declared.

• Senator REED. Who were the representatives of the Government who came to you as early as February and talked to you in regard to this building of aeroplanes on a large scale?

Mr. GUY. Maj. Hutton was one. Capt. Clark, who is now, I think, Col. Clark, was another. Mr. Waldon, who is now Col. Waldon—I will not say that he came in February, but he came after that date, in March or early in April. I will not say just when these different men came, but Capt. Clark and Maj. Hutton were the two that came back in February, with possibly one or two other officials, and a man by the name of Col. Martin was along.

Senator REED. In February, what reasons did they assign as to why the Government was likely to need a very large number of aeroplanes?

Mr. GUY. I don't remember any specific reasons—only that the Government seemed to be adopting an attitude of preparedness; they would probably want these machines in getting prepared.

Senator REED. When was it that they first asked Mr. Curtiss to build an extra plant—this large new building?

Mr. GUY. They asked representatives of the Curtiss Co. in the latter part of July, 1917.

Mr. GUY. In the latter part of July, 1917.

Senator REED. Had you any correspondence back there in the month of February or prior to that time in reference to building planes for the Government—building a large number of planes, not just one or two or half a dozen?

Mr. GUY. I don't recall any correspondence of that character. There may have been some. I will investigate and find out.

Senator REED. Anyway, the result of these visits was such that even before we went into the war you had begun to get on hand or begun to prepare yourselves to get on hand a large amount of supplies so that you could fill any reasonable orders that the Government might give, and that accounts for the fact that you did have materials on hand so that on June 30, when you got their order for the first 600, you were able to produce some right away?

Mr. GUY. Yes, sir.

Senator REED. When did you get the next order?

Mr. GUY. The next order of any size that we got was, if I remember correctly, about September 19, I guess. On that day we got an order—I think these all came about the same time—for 3,000 Spads, 500 Capronis, 1,400 JN4 machines—I guess we called them JN4D then. I believe that was all.

Senator REED. Had you at that time completed your order for the 600?

Mr. GUY. No; but very nearly completed them. That is all I remember at that date. Of course I am giving you this all from memory.

Senator REED. I think you had better get your order sheets. Tell us what the Spad machine is. How is it distinguished from these other machines?

Mr. GUY. A Spad machine is a French model. Spad—those four letters represent a French manufacturing concern. I can not give you their name. They call it the Spad machine. It is a French type of machine with a Hispano-Suiza motor.

Senator REED. How many men does it carry?

Mr. GUY. The model we had here was a one-man machine.

Senator REED. Was that a fighting machine?

Mr. GUY. Yes.

Senator REED. When I say fighting machine throughout this examination, I mean a machine of attack, not merely a machine with defensive apparatus but one used for attack.

Mr. GUY. That is what it was, a fighting machine.

Senator REED. As it was manufactured by the French it was equipped with the Hispano-Suiza engine?

Mr. GUY. Yes.

Senator REED. Had you ever made any of these machines before?

Mr. GUY. We never had.

Senator REED. Did you have the plans and specifications for the aeroplane?

Mr. GUY. We did not have the plans or specifications at the time the order was given, but shortly after that, within a very few days, such drawings as they had and a machine itself was shipped to our plant; that was prior to the completion of this plant; and we put it in what is known as our engineering department now and assembled the machine and started our drafting department to making an exact copy of the job for manufacturing purposes.

Senator REED. How soon did you get that machine after the 15th of September when the order was given?

Mr. GUY. The machine arrived and was assembled on September 19th.

Senator REED. Your records will show.

Mr. GUY. Yes.

Senator REED. You have the privilege of making any correction you wish on that. You do not remember anyway of any delay that occurred to you by virtue of a failure to get the necessary information, because you say you may have had the machine itself even before the 15th of September?

Mr. GUY. Oh, no. When it was determined that we were to build the Spad machine, and when we received a contract for it we were given sufficient information to proceed immediately or proceed promptly with the designs; that is, drawings necessary to manufacture that design.

Senator REED. All right. You put your draughtsmen to work on making the detail drawings, I suppose that is what you mean, of this Spad machine, so that with those detailed drawings your force of experts and the mechanics could go to work to produce the machine.

Mr. GUY. To manufacture it; yes, sir.

Senator REED. How far did you progress on that?

Mr. GUY. We had the drawings practically finished within, say, 10 per cent of being finished, or 90 per cent finished, and we were ready to proceed with the manufacture of this machine. I may state that the additional 10 per cent of drawings covered principally the power-plant installation; that is, the motor and the gun installation. This 10 per cent of the plans was always the last part of the drawings that were completed, and would not necessarily hold up the production of the planes.

Senator REED. How long did that take? When were you ready to proceed with the manufacture?

Mr. GUY. My recollection is around the 20th of October.

Senator REED. So that practically a little over a month had been consumed in getting actually ready?

Mr. GUY. That is right.

Senator REED. Now, in addition to making the detailed drawings, what else was necessary, and what had you done during these 35 days that intervened between the date of the contract and the 20th of October?

Mr. GUY. We had inspected the machine very carefully and our various departments had tabulated and purchased some of the material that was to go into the machine.

The CHAIRMAN. What sort of machine gun was used with the Spad, if you remember?

Mr. GUY. I can not tell you offhand, sir; it was a French machine that came over here equipped with a gun. Our various departments, as I said, had tabulated and prepared schedules, bills of material for the different kind of material that went into the machine, and our purchasing department had actually purchased; that is, they had placed contracts for the purchase of some of the material that had gone over the machine during this time that we were getting the drawings ready and were seeking sources and preparing to order material.

The CHAIRMAN. Had you done anything else with that? Did you have any machinery made or any apparatus to be employed?

Mr. GUY. We had some tools, jigs, fixtures, and some equipment in process of manufacture. (Referring to some documents.) The 19th of September is the date of this contract, No. 20001.

Senator REED. This brings us up to approximately October 20. What happened to you on October 20?

Mr. GUY. That date we were advised by Washington to hold up on the Spads.

Senator REED. Were you advised in writing or in some other way?

Mr. GUY. I think that we had either a telegraphic message or a letter. I think I can get that for you.

Senator FRELINGHUYSEN. When was the Spad sent away and where was it sent to?

Mr. GUY. I can tell you when the Spad machine was shipped away from here. Here is a telegram signed by Mr. Morgan, and addressed to Col. Deeds on November 20, 1917, advising that Spad machine will leave for Dayton to-night via American Express. I might say that the Spad machine was all set up in our shop on September 19. I might say in connection with Spads that we had one complete machine, another machine that was complete without a motor, with the exception that the wings were not covered, and then sufficient parts for almost a third machine.

Senator REED. Do I understand that at the time this order was canceled you had the material, you had the plans and the jigs, and different other machinery that is necessary, and that you were prepared to go ahead and produce speedily and promptly the Spad machine?

Mr. GUY. We did not have all the material ordered. We did not have all tools, but they were under way and in process of manufacture.

Senator REED. Would you have had them with reasonable promptness?

Mr. GUY. We certainly would, as we had placed the orders as the drawings developed so that the tools would be ready when we were ready for production on the job.

Senator REED. How soon would you say you would have been ready for production?

Mr. GUY. May I digress for your information and say this: In every manufacturing business of similar character to this, say, take the International Harvester business, where they are making wood machines, it is generally conceded that it takes about six months from the time that you get an order until you ship it out of the back door. In our business we have been able to work on a four months' basis, so that on that basis from the 20th of October we should have been in production on that machine, that is, we should have begun shipping them somewhere around February, 1918, I should say.

Senator REED. When I speak of production, I do not mean the finished machine. If this order had not been canceled, how soon would you have been in the actual work of construction?

Mr. GUY. We would have been fabricating parts in November.

Senator REED. Within a few days?

Mr. GUY. Yes; very shortly after.

Senator REED. I am asking you now, in the absence of your papers, what reason was given for the cancellation of this order for 3,000 Spads.

Mr. GUY. Our understanding was that they did not want that type of machine on the fighting front; that they wanted a two-place machine instead of a one-place and a two-passenger instead of a one-passenger.

The CHAIRMAN. Was the Spad a biplane?

Mr. GUY. It was a biplane.

Senator REED. Who communicated to you these orders of cancellation?

Mr. GUY. Well, I will have to look up my records to be sure, but my recollection is that it was Col. Montgomery.

Senator REED. What was the horsepower of the engine that was to be employed in this machine, this Hispano-Suiza engine?

Mr. GUY. The engine that was in the machine was a 220 horsepower.

Senator REED. You were not to furnish the engines; they were to be furnished to you. Were you to place them in the airplanes?

Mr. GUY. Yes.

Senator REED. But it was a 200-horsepower engine?

Mr. GUY. That is my recollection of it. You see that was a geared job and I think it was a 220 horse. As a matter of fact, we did not pay a whole lot of attention to the engine, because we were not going to manufacture it.

Senator REED. As far as the Spad machine is concerned, then, your connection with it ceased on October 20, except that you shipped away your sample machine to Dayton, Ohio?

Mr. GUY. Yes; about that date.

Senator REED. What about your order for the 500 Capronis which you received also on September 15?

Mr. GUY. We never got any information regarding that enabling us to proceed with the order.

Senator REED. The Government never furnished you with blue prints nor details, nor specifications, nor anything to help you to go on? Did you ever ask for them?

Mr. GUY. Yes.

Senator REED. How often?

Mr. GUY. I could not tell you offhand, but Mr. Morgan, who was vice president of our company and who carried on practically all negotiations personally with Washington because he had spent a great portion of his time down there, asked about the Caproni drawings and other information repeatedly. I know that because he told me on his return trips that he had been trying to get some information about the Caproni machines, but they were not in position to furnish it.

Senator REED. Have you any correspondence with regard to that topic?

Mr. GUY. I will have to look it up.

Senator REED. I mean from your factory and to your factory, and if you have any memorandum that was made at the time showing your efforts to get the information we would like to have that, and have it attached to the record.

Mr. GUY. All right.

Senator REED. I want to go back. On June 30, or approximately then, you got your first order for 600 JN4's, and you were ready with your materials, and you commenced at once to get those out and you did get them out promptly, but you don't remember just when you completed your 600. I wish you would find out just when you did.

Mr. GUY. All right.

Senator REED. Did you lose any time for lack of orders from the Government up to the time that you received the order of September 15, for 600 JN4's.

Mr. GUY. It would be practically impossible for us to tell you how much time we lost, but the fact that we did not have orders for volume production on these machines promptly after the first order necessarily retarded our ultimate results, or ultimate production on those machines.

Senator REED. This is the thing I want to get at. You had factories for the production of airplanes. You got an order on June 30 for 600 JN4's, and do not appear to have received another order until September 15.

Mr. GUY. Yes.

Senator REED. During that interim if you had had additional orders placed with you could you have given an additional production over and above what has been produced?

Mr. GUY. We probably could not during that particular interval, but we could have produced substantially more machines at a subsequent date.

Senator REED. That is to say that you would have begun during that interval and by this time would have produced more machines?

Mr. GUY. Yes, sir.

Senator REED. Before this time?

Mr. GUY. Yes, sir.

Senator REED. Can you give us any idea of how much loss of time there was there?

Mr. GUY. Well, sir. I could not do that without doing some figuring, and I doubt if I could give you any definite information on it because it would be a matter of estimation largely. I can give you a schedule of our production of airplanes for five months since we received that first order, and which will show that we have very materially increased our output at our Churchill Street plant where these orders were filled—even with the quantity orders we have here now—with the 1,400 and the ones to follow—it will show that we have very materially increased our production.

Senator REED. Suppose this order for the Capronis had not been canceled, and suppose you had received promptly, at the time the order was placed, plans and specifications and all information necessary to produce the machines, within what time could you have produced the 500 Capronis?

Mr. GUY. We could have begun shipping those Capronis probably within four months from the date we got all this information that you speak of.

Senator REED. How long would it have taken to complete the order for the 500?

Mr. GUY. I want to say that that is rather a difficult question to answer because the Caproni is a type of machine we have never built.

It is a heavy bombing machine and until within the last four or five weeks I personally had never seen a Caproni until I saw one at the Standard plant.

Senator REED. You say that you could have begun the production within four monthes. I am trying to get an idea of how long it would have taken to complete it. What is your estimate of that?

Mr. GUY. My estimate is that we could have finished that job within another four months, or eight months all told from the time that we got all our information up until we finished shipments.

Senator REED. So that if on September 15 you had received your information, that being the date of the order, about this time you would have had the 500 machines out?

Mr. GUY. That is correct.

Senator REED. May I ask another question along the same line. I want to ascertain how much you might have reasonably increased your production if you had had your orders promptly after we entered the war?

Mr. GUY. That is a matter, Senator, that would require some estimating, and it would depend largely upon the type of machine we were to produce. If we had orders for training planes at the time we entered the war or thereabouts, it is my opinion that the Curtiss Co. could have produced all the training planes that were required by the Government in sufficient time to have probably met their training school requirements.

Senator REED. We now come to the order of September 15 for 3,000 Spads. Was it finally canceled or does it still hang suspended without any information?

Mr. GUY. My recollection is that some other machines were substituted along in November, and just recently, within the last couple of weeks, the Signal Corps have given us a verbal order which they tell us will be followed up by a definite order for 500 Capronis.

The CHAIRMAN. You don't mean Signal Corps.

Mr. GUY. I mean the Army department.

The CHAIRMAN. This order came from Mr. Ryan?

Mr. GUY. It came through Mr. Kellogg, who is Mr. Potter's assistant.

The CHAIRMAN. That is, since the reorganization?

Mr. GUY. Yes.

The CHAIRMAN. Let us get this matter accurately. Suppose you send for your letter of January 28 and contracts Nos. 20035, 20387, 20907, 20401, and 21036.

Senator REED. It had arrived a day or two before that?

Mr. GUY. Yes; it was probably two or three days before, as I remember. The Spad machine had a Vickers gun design, and it was redesigned for a Marlin gun.

Senator REED. In connection with your last answer, you say that the Spad that was sent you had a Vickers gun on it but was to be redesigned for a Marlin gun. Where is the Vickers gun made; in the United States?

Mr. GUY. I think it is a British gun now being made in the United States.

Senator REED. Was it at that time made in the United States?

Mr. GUY. I could not tell you.

Senator REED. The Marlin gun was being made in the United States?

Mr. GUY. Yes.

Senator REED. Do you know whether it involved much of a change to fix the machine for a Marlin gun?

Mr. GUY. Well, it required some change for that gun. The change was substantial, but as to just how much I don't know how to express it.

Senator FRELINGHUYSEN. It had to be synchronized?

Mr. GUY. The Marlin gun had to be synchronized in a different way than the Vickers gun. Whenever there is any change in a model it involves a delay. It is something that is bound to cause untold difficulty. The French had offered to supply us with 1,000 Vickers guns to be used on the Spad machines. The Vickers gun was being manufactured by the French at that time and was not being manufactured in the United States.

Senator REED. The 1,000 guns available through this French offer could have been put on the machines without any change being made in the machine so far as the gun was concerned?

Mr. GUY. That is correct. On these large orders we sign a contract, and then the Signal Corps would issue an order in addition to the contract. This was merely more for their departmental routine. It was what they referred to in their invoices when the invoices were rendered, which was really an extract of the contract. That may have been dated later than the contract on account of the routine of the office there. That order, by the way, is what we do business on. We make our invoices and everything in reference to the order and not the contract. We were very reluctant to let the Spad machine go because we were in hopes that we might be able to go ahead with the contract.

(The order and contract of January 10 were produced at this point.)

Senator REED. I am referring now again to the order for 3,000 Spads which was given to you in September, on which you have done the work you have already described. In the book which you have furnished me there appears the formal order, which is Order No. 20035, which is dated October 8, 1917. It is for 3,000 Spads and 500 bombing planes. That sheet, while dated a month later, was really a formal order made in pursuance of the contract which had been previously made, as you have stated?

Mr. GUY. Yes; that is correct.

Senator REED. On January 10 or 11 you appear to have made a contract, No. 20387, the Government being represented by A. C. Downey, a major in the Signal Corps, contracting officer, in which you agreed to furnish 2,000 Bristol fighter aeroplanes complete without engines, and assembled complete—to the Government—that is paragraph A—and spare parts for the engine above mentioned as set forth in schedule C hereto attached, etc. Did you have anything to do personally with the making of this contract?

Mr. GUY. I did not.

Senator REED. Who represented your company in that?

Mr. GUY. Mr. Morgan.

Senator REED. I am putting this contract in at this time because of a reference which appears in the letter of January 28, and that

letter I now read. It is on the War Department letterhead, office of the Chief Signal Officer, Washington, January 28, 1918, from Office Chief Signal Officer to Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y. Subject: Cancellation of order 20035:

"1. Referring to Signal Corps order 20035 placed with you October 8, 1917, for aeroplanes, you are advised that in view of the fact that this order is superseded by order No. 20387, placed with you January 10, 1918, the above order is canceled. By direction of the Chief Signal Officer. O. R. Ewing, First Lieutenant, R. C. A. S."

Senator REED. So now it appears that this order for 3,000 Spad planes were canceled, or treated as canceled, by the January 10 order for 2,000 Bristol fighters?

Mr. GUY. Yes.

Senator REED. But, as a matter of fact, prior to January 10, away back in November, you had been ordered to ship the Spad machine away and you had really ceased work on the Spad machine along about that time?

Mr. GUY. We had really ceased work on the Spad machine prior to that time. We had a definite hold-up on the machine prior to October 26.

Senator REED. To summarize this thing up to this point: You had an order for 3,000 Spads and 500 Capronis. The Spad order was canceled as heretofore described, and you never got any information about the Capronis, and never did anything about manufacturing them because of the lack of information which you repeatedly tried to get.

Mr. GUY. Yes.

Senator REED. And that brings us up to the question of the next order that you did actually receive. I have a memorandum here that about September 19 you got an order, No. 20001, for 1,400 JN4D's. Is that correct?

Mr. GUY. We got an order for 1,400 JN4D's about the same time as the order for the Spads. This is dated September 19, order 20001. for 1,400 JN4D's.

Senator REED. Have you produced all those?

Mr. GUY. Yes, sir.

Senator REED. When did you complete the production of those?

Mr. GUY. We completed the production of those, I think, in May of this year.

Senator NEW. That is, the last month?

Mr. GUY. Yes.

Senator REED. Did you suffer any delays in the getting out the order by reason of anything that the Government did?

Mr. GUY. The reason that that particular order was not finished prior to May was that the Government was very anxious to have us furnish JN4H machines ahead of the JN4D's, so that we allowed the JN4D order to run along as a fill-in on our production. The JN4D machine has a Curtiss OX5 motor. The JN4H has a Hispano-Suiza motor in it, the H standing for the Hispano-Suiza motor.

Senator FRELINGHUYSEN. Are these all primary training planes?

Mr. GUY. The JN4H machine is regarded as an advanced training plane.

Senator REED. That order for 1,400 JN4D's, which is a primary training plane, was delayed or held back in order that you might, at

the request of the Government, furnish 600 JN4H's, which is the Curtiss plane with the Hispano-Suiza engine, and which you regard as an advanced training plane?

Mr. GUY. That is correct.

Senator REED. Have you produced all of those 600 JN4H's?

Mr. GUY. We are working on the last 100 of the 600 JN4H's.

Senator REED. How soon will they be out?

Mr. GUY. We hope to have them out this month.

Senator FRELINGHUYSEN. Where are the engines to be supplied from for these JN4H's?

Mr. GUY. We have a large number of them on hand, and the others are coming from the Wright-Martin Co., of New Brunswick.

Senator FRELINGHUYSEN. They are a 150-horsepower engine?

Mr. GUY. Yes, sir.

Senator FRELINGHUYSEN. Are they being supplied in sufficient quantity to equip these planes?

Mr. GUY. We have had no delays on that motor.

Senator REED. You have had no trouble with the Government on the 1,400 JN4D's, except that they asked you to hold it back enough to get out the 600 advanced training planes?

Mr. GUY. Further than that, on the last 200 of that order they asked us to modify the machine for storage purposes. They did not want us to cover the wings, and they did not want us to do a lot of things that we ordinarily do in building a complete machine, for the reason that the Government wanted to put these machines in storage, as we understood it, and wanted them properly cared for, so that they would not deteriorate in storage, asking us to varnish and enamel other parts which we would not do in shipping them out for service.

Senator REED. Did that make very much delay?

Mr. GUY. It did, because it modified our plan of manufacture.

Senator REED. Well, it did not delay the Government eventually, because the Government wanted to store the machines.

Mr. GUY. I know, but it delayed the Curtiss Co.'s production.

Senator REED. For the purpose of the record, I have a memorandum which states that order 20387, dated January 10, 1918, and calling for 2,000 Bristol fighters and spares, was amended under date of March 30, 1918, so as to cancel the spares therefrom, and a new order calling for spares for 1,200 Bristol fighters. Is that a substantially correct statement?

Mr. GUY. I think that is about correct.

Senator FRELINGHUYSEN. Do I understand that you are making spares for the Bristol fighters?

Mr. GUY. We understand that we are to make a certain quantity of spares.

Senator FRELINGHUYSEN. How many?

Mr. GUY. I think they are figuring it on 60 per cent of the machines.

Senator FRELINGHUYSEN. To whom was the contract for the other spares allotted?

Mr. GUY. I could not tell you that.

Senator FRELINGHUYSEN. Do you know any reason why that contract was taken away from you?

Mr. GUY. I do not positively know any reason, only I have heard members of the Signal Corps state at different times that it was their intention to have other manufacturers work on the spares.

Senator FRELINGHUYSEN. You had facilities for making them here?

Mr. GUY. Yes.

Senator FRELINGHUYSEN. Could you make them as cheaply as any other manufacturers?

Mr. GUY. We think we can.

Senator FRELINGHUYSEN. Would there be added cost in express and shipment if they were made elsewhere?

Mr. GUY. Not necessarily that, but if other manufacturers made the spares, they would have to come to us for detailed drawings, and there would naturally be delays in getting those drawings, and possibly some inaccuracies would develop owing to the different manufacturing methods of the other people. In other words, we turn out drawings to fit our process of manufacture, and those do not always fit in with the other manufacturers, and inaccuracies develop that take time to correct.

Senator FRELINGHUYSEN. Who are making these spares for you now?

Mr. GUY. No one is making them for us. We are making such spares as we need for the Bristols ourselves. No one else makes them for us. If made at all they are making them for the Government.

Senator REED. I have a memorandum that on April 30 of this year there was an order given you for 700 JN4H's.

Mr. GUY. Let me state in that connection that I have an order here which was dated December 29, and which is Order No. 20401. for 700 JN4D machines.

Senator REED. What happened to that order?

Mr. GUY. They canceled that order.

Senator REED. At the time had you started any work on it?

Mr. GUY. Yes.

Senator REED. How far had you gone in production?

Mr. GUY. We had fabricated practically all the parts for that order but had not assembled the machines.

Senator REED. What happened then?

Mr. GUY. They then decided on the JN4H model instead of the JN4D.

Senator REED. What date was that?

Mr. GUY. They canceled this order and gave us another for JN4H's.

Senator REED. Have you any written correspondence about it?

Senator NEW. What became of the parts of the order of December 29, which you had fabricated up to that time; were they scrapped?

Mr. GUY. Some went into the JN4H's, the rest were taken up with the Government to try to get reimbursement for them.

Senator NEW. And the other parts were scrapped?

Mr. GUY. Yes; unless they can use them as spares.

Senator NEW. Can you approximate for us the value of those parts which can not be utilized.

Mr. GUY. I think I can get an approximation for you. It would require some checking up and figuring, but I think I can get it for you this afternoon.

Senator REED. The amount of it is that you had an order, December 29, for 700 JN4D's and you had completely fabricated and were ready to assemble them when they canceled the order, and ordered you to make JN4H's. What was the date of that cancellation?

Mr. GUY. April 29, 1918.

Senator REED. That is order No. 20036 and none of those have yet been produced and delivered. Is that right?

Mr. GUY. Not of the 700 JN4D's.

Senator REED. Have you suffered any delay in the production of these particular 700 JN4H's since the Government issued the order?

Mr. GUY. Yes; we have suffered considerable delay for the reason that the Government has asked us to build about four different types of H's on this order of 700.

Senator REED. Why different types?

Mr. GUY. The JN4H type originally was the same as the JN4D with the substitution of a Hispano-Suiza motor for a Curtiss motor. That required some change but not a very material change in order to get the new motor. Then, after giving us the order for the 700 JN4H's, they asked us to build what they called a gunner, that is, a JN4H with a rear gun mount and with a Marlin gun in the front. They then asked us to build a certain quantity of pursuit machines which is a type of plane equipped with a sort of telescopic arrangement, and then, in addition to that, they wanted us to build some——

Senator REED. By telescopic arrangement, do you mean a telescope to look through?

Mr. GUY. Yes; they have a telescopic arrangement on the machines that they look through and it answers the purpose of the gun, that is, they sight through this thing and when they see their object they don't shoot, but they theoretically shoot.

Senator REED. What is the object of that?

Mr. GUY. Instead of shooting at them they sight at them with this telescope. It is a training machine. It is practice to sight the enemy to get the enemy in range.

Senator REED. What other changes were made?

Mr. GUY. In addition they have a bomber which has certain of the equipment of the other types, and has a bomb-dropping device on it, and then they have another machine on which they have radio equipment for wireless.

Senator REED. You have been in the aeroplane business a good while, I suppose?

Mr. GUY. About a year and a half.

Senator REED. Anyway, that is long enough for you to have become pretty familiar with this whole question of fighting planes and training planes, etc. I don't mean as a special expert, perhaps, but you have a pretty good general knowledge of the situation?

Mr. GUY. Yes.

Senator REED. Was it not necessary to have some of these additions, experiments, if you please, added to the machines? Was that not a wise and proper thing to do?

Mr. GUY. From the Government's standpoint it seems to me that it is quite essential that the Signal Corps should have different types of machines for training purposes.

Senator REED. You have spoken of this delaying, and, of course, everything delays the manufacturer, but was the Government in

any way derelict in the matter of giving you the plans with reasonable promptness, taking into consideration the difficulties incident to such changes?

Mr. GUY. Of course, looking at it from a manufacturer's standpoint, naturally we are prejudiced. Anything that delays us is, of course, important from a manufacturing standpoint. On the other hand, I do believe that at a time when the Government actually made up their minds as to what they wanted on these different machines, that we have been getting the information probably as fast as we could expect to get it.

Senator REED. Isn't it inevitable that when a Government starts in on a project of training a great number of young men to fight on the front—a thing we had never really planned—and you did not have the proper type of planes in your factory. You were making planes for sporting purposes and all that sort of thing, except as you made them for the British army—isn't it inevitable that new uses will be developed and that it takes some time when they have been developed to make the plans and work out the plans so that they can be practically applied to a machine—that takes some time, does it not?

Mr. GUY. Oh, yes.

Senator REED. Now, making a reasonable allowance for the necessary amount of time, do you think that the Government officers—Army or Navy officers—whoever had charge of this work, was guilty of any unreasonable or unnecessary delays?

Mr. GUY. Well, I——

Senator REED. I will say the Army.

Mr. GUY. I really don't know how to answer that, Senator, because I am not very familiar with how the Government operates.

Senator REED. I don't care how the Government operates. Suppose it had been a private individual confronted with the fact that they had discovered that they needed to add this telescopic arrangement—I will just take that one as an example—or that they needed to put on a gun to fire to the rear—of course it takes some time to make the plans and details for work of that kind. Making reasonable allowances for the difficulties, was there a delay that could be said to be too long?

Mr. GUY. I think, Senator, that speaking of it purely from a delay standpoint, it would appear to me, as a layman more or less ignorant of Government requirements, that they did take rather a long time to decide that they wanted this particular type of training machine from the beginning of the war until we first knew that they wanted them.

Senator REED. Yes; but after they told you that they wanted them—after they discovered that they did want to put this gun on to fire to the rear—I will use that as a typical instance—did they then delay you in getting out the plans and holding you up any longer than would seem to be necessary.

Mr. GUY. I think that we were delayed in not getting all the information necessary about building that model.

Senator REED. Did you people get up the plans or the Government get up the plans for putting the gun on, for instance?

Mr. GUY. The Government furnished us the information and we made the drawings.

Senator REED. The Government told you they wanted to put a certain gun on a machine.

Mr. GUY. Yes.

Senator REED. And you had the machine and you had to make the plans; is that right?

Mr. GUY. That is correct in most of the cases in regard to this particular model.

Senator REED. Is your complaint on that ground? Do you recall that as a serious delay, a serious hold-up, in getting to you this information? How long was it? I just want to get a fair statement of this thing and let the chips fall wherever they may happen to fall.

Mr. GUY. These different models of machines for the Hispano-Suiza engines had been talked of, I should say, between three and four months and we received an order for these machines in the latter part of April, as I recollect it, and to date we have not all the information that is necessary for all of the different models that we are to manufacture under this order.

Senator REED. Can you tell us how many different models you are to make under this order?

Mr. GUY. I think it is four.

Senator REED. How many do you have complete information on?

Mr. GUY. Only one at this time.

Senator REED. Have you made any complaint?

Mr. GUY. Yes; we have been after the information repeatedly.

Senator REED. Have you written about it?

Mr. GUY. I think there has been something written about it. There have been many talks about it with the various members, and I think there have been, probably, some telegrams about it.

Senator NEW. Your record will probably show whether those delays were serious or not.

Mr. GUY. I think they will.

Senator NEW. The telegrams between you and the Government and the correspondence between you and the Government would be valuable here.

Senator REED. You were about to speak of the last 700 JN4H's which were ordered, and you have said to us that there were several different types. Please state what the types were and the number of machines of each type.

Mr. GUY. Three hundred and twenty-five gunners, 150 bombers, 100 observation, 125 pursuit.

Senator REED. You are now getting the data to show how much information you lacked and when you did receive the information, and you can attach that or fill that in later as a part of your answer.

Mr. GUY. All right.

Senator REED. I believe that brings us up to your contract for the 2,000 Bristol fighters and spares which you obtained about January 10. Is that right?

Mr. GUY. That is correct.

Senator REED. Your contract for spares was amended under date of March 30 so as to cancel certain of the spare parts. I understand that when you make a machine you make duplicate parts which you call spares which are used to replace the parts of the machine which may be broken or worn out?

Mr. GUY. That is correct.

Senator REED. What was your contract for spares originally before it was canceled or changed?

Mr. GUY. The contract called for 2,000 Bristols and a certain number of spares, as shown by the Schedule B attached to the contract.

Senator REED. What was the aggregate of those spares in dollars?

Mr. GUY. The bogey price was \$2,476,185.

Senator REED. What do you mean by "bogey price"?

Mr. GUY. This contract is a cost plus contract, which means that a bogey price is determined or an estimated cost price and we get 12½ per cent profit on this bogey or estimated cost.

Senator REED. The meaning of bogey price is the estimated cost price?

Mr. GUY. Yes.

Senator REED. When did you receive that order canceling a part of the order for spares?

Mr. GUY. Do you mean the original order?

Senator REED. The cancellation order. I have a memorandum here that states that the order for spares was amended March 30 so as to cancel the spares therefrom.

Mr. GUY. Here is a letter under date of March [reading]:

Referring to Signal Corps order No. 20387, placed with you January 10, 1918, and calling for 2,000 Bristol fighter aeroplanes, you are advised that this order is hereby amended to cancel the spare parts as ordered under this order and which show only on contract No. 2463, which covers same.

Senator REED. Did you understand that they canceled this entire order for spares of over \$2,000,000.

Mr. GUY. They did.

Senator REED. Did you then get an order for some spares after that?

Mr. GUY. Yes, we got an order.

Senator REED. And the order placed for spare parts for Bristol fighters, under date of April 27, 1918, was a new order? Do you find that order?

Mr. GUY. I don't find that particular order. Here is a contract No. 2463-2, order No. 20387- [reading]:

The contractors shall make for the Government 1,200 sets of spare parts for the Bristol fighters.

This is order No. 2443, contract No. 2090 on March 30.

Senator REED. Originally you had an order for how many sets; that \$2,000,000 and over?

Mr. GUY. Yes, but they were not given in complete sets. It amounted to \$2,476,000.

Senator REED. What we desire is a statement showing the amount by which the original order of \$2,476,000 was reduced by this order of cancellation dated April 3. You stated a while ago that you thought you retained about 60 per cent. You say that order went to Dayton, that is, that somebody in Dayton got the order for that part of the spares which were taken away from you. Is that correct?

Mr. GUY. I don't recall stating that this spare order went to Dayton.

Senator REED. I may be in error about it.

Mr. GUY. In addition, I want to correct the statement about 60 per cent. What I meant by that is that it was my understanding that the Government was ordering about 60 per cent of spares with each order.

Senator REED. Instead of a complete set of spares?

Mr. GUY. Yes. I mean 60 per cent of the total machine order in spares.

Senator REED. Do you understand now—since we are trying to make some corrections—that when the order for spares which you had was reduced, some other concern got an order for spares to take the place of this reduction which had been made in your order?

Mr. GUY. I have no knowledge of that other than what had been told me by various members of the Signal Corps at different times, that it was their intention to have other manufacturers make spares for the Bristol.

Senator REED. What officers of the Signal Corps had you talked that over with? I desire their names so we can ask them what they did do.

Mr. GUY. Maj. Shepler was one. He is no longer a major, and has resigned, and is located at Dayton, Ohio, in charge of production at the Dayton-Wright plant, for the Equipment Division.

Senator REED. Is he working for the Dayton people?

Mr. GUY. No; for the Government.

Senator REED. But he is no longer a major?

Mr. GUY. He is no longer a major. I also talked with Maj. Martin, Lieut. Farwell, who was Maj. Shepler's assistant.

Senator REED. Did the Curtiss people protest in any way against the cancellation of these orders?

Mr. GUY. Which order?

Senator REED. This last order I am speaking of now for spares?

Mr. GUY. We have not protested seriously against the cancellation of this particular order for spares, only verbally, and I think that was done by Mr. Kepperley to Mr. Kellogg and Mr. Fletcher.

Senator REED. Who are Mr. Kellogg and Mr. Fletcher?

Mr. GUY. Mr. Kellogg is Mr. Potter's assistant and likewise so is Mr. Fletcher.

Senator REED. Where are you to make your deliveries of the spares?

Mr. GUY. At the factory.

Senator REED. Where are you to make deliveries of the planes?

Mr. GUY. At the factory, outside of some R9's, which were ordered, as I stated, either before or just after our entry into the war.

Senator REED. What is the R9?

Mr. GUY. The R9 is an outgrowth of the R6, which was a sort of reconnaissance machine which we were building for the Army and Navy prior to our starting in the war. It was a model which accommodated a 200-horsepower Curtiss motor.

Senator REED. How many of those have you made?

Mr. GUY. The last order we got for those called for a total of 122.

Senator REED. When did you get that? Get your records and tell us how many of those machines have been ordered since we entered into the war and how many you have produced, and if you have not

produced them all, state to us, in answer to this question, the percentage of production which you have obtained.

Mr. GUY. We have produced all of the R9 machines.

Senator REED. Did you suffer any delays by reason of anything that our Government did or failed to do touching these R9's?

Mr. GUY. The R9 machines were originally ordered by the Signal Corps as R6's. These 122 R9 machines were originally ordered by the Signal Corps and were transferred to the Navy, and a Navy order under date of January 8, 1918, was issued.

Senator REED. Has that order been filled?

Mr. GUY. That order has been completed. I think we have covered all of the substantial orders for the Army with the possible exception of six R4 Liberty mail machines which we made recently for the mail service, which were transferred over from the Signal Corps production to the Postmaster's Department.

Senator REED. This brings us up, I think, in orderly sequence to the Bristol fighters. You told us of the last 1,200 JN4H's, and how they were divided into four classes of machines which you were making, or types. How are you coming on with the production? None of them have yet been delivered, I believe.

Mr. GUY. We are getting along with this fairly well, but there are going to be delays in getting the machines out on account of our not having yet received all of the information necessary on the different models.

Senator REED. Have you obtained from your office help here the information we asked for a little while ago as to the amount of information you are still lacking?

Mr. GUY. Yes, I have my file on that subject but they have not given me that particularly information yet.

Senator REED. In answer to this statement I am now making. when you come to read over your copy of these notes, I wish you would give us a clear and concise statement of the delays you have suffered by the Government's failure to furnish you with the information necessary to produce the particular types of the JN4 which you have alluded to as being the subdivisions of the last order of 700.

Mr. GUY. I have the date of the contracts on these R machines, if you would like it.

Senator REED. I wish you would put the dates in at the proper point in the record.

Mr. GUY. The date was July 20, 1917, and it was contract No. 1506, Signal Corps Order No. 8460, calling for 72 R6 seaplanes, and 36 R4 airplanes.

Senator REED. I think we are now logically arrived at the order for Bristol fighters, and in order to take that up, I would like to have you now state at this point the date of that order. Was it about January 10?

Mr. GUY. January 10 is right.

Senator REED. Is that Order No. 20387?

Mr. GUY. It is.

Senator REED. And I think the estimated cost was \$13,500,000; is that correct?

Mr. GUY. No; the estimated amount of this contract was \$12,000,000 for the machines, and \$2,476,185 for the spares, making a total of \$14,476,185.

Senator REED. Before I come to the Bristol contract specifically, I want to go back. Was there any attempt made to make you put into any of these machines you have heretofore described any other motors than the ones you have referred to, namely, the Hispano-Suiza, and the motor that you have been using in the Curtiss planes?

Mr. GUY. The Curtiss OX5?

Senator REED. Yes.

Mr. GUY. When the Spad contract was signed and the machine was here for the purpose of getting it ready for production, it was the intention of the Signal Corps to put the 8-cylinder Liberty motor into this machine. Somehow or other they decided to discontinue the 8-cylinder motor, and they thought then they could possibly put the 12-cylinder motor into the Spad, but they found that the Spad would not accommodate the Liberty motor.

Senator REED. That is a very illuminating and brief statement. I wish that you would now, that you are here personally and familiar with those negotiations, give us somewhat in detail the efforts that were made to put the Liberty motor into the Spad flyer.

Mr. GUY. The only efforts that were made to put that motor into the Spad flyer was a consultation of engineers representing the Signal Corps and our own company.

Senator REED. When did those consultations begin?

Mr. GUY. I should say around the latter part of September or the first part of October, 1917.

Senator REED. How many consultations were had?

Mr. GUY. I think that after one very serious consultation it was very easily determined that that motor would not fit into the machine.

Senator REED. Who took part in that consultation?

Mr. GUY. Mr. G. H. Mueller, our chief engineer, Col. Clark, of the Signal Corps. Col. Waldon, of the Signal Corps. I don't remember any others of prominence that were in that consultation, as those were the principal men.

Senator REED. Who suggested that it go in, your men or the Government's men.

Mr. GUY. The Government's men.

Senator REED. Did those men you have mentioned as representing the Government think that it should go in? Was that their insistence to start with?

Mr. GUY. Apparently so.

Senator REED. First the 8 and then the 12?

Mr. GUY. Yes.

Senator REED. Was this all done in one consultation, first the suggestion of the 8 in this consultation, and then the suggestion of the 12, or were other consultations held about the matter?

Mr. GUY. There were one or two consultations, but it was determined finally at the second consultation that we had here, as I remember it.

Senator REED. How long were the consultations apart?

Mr. GUY. Several days.

Senator REED. And in the first consultation the Army officers suggested the 8-cylinder, and that was turned down afterward as a result of the consultation, and then they came back several days later with the proposition of the 12-cylinder. Is that the way you

have it in your recollection? I don't want to state this case for you. I am only asking it in that form, to call your attention to it.

Mr. GUY. I don't know really why they decided not to put the Liberty motor into the Spad plane, unless it was for one or two, or both of these reasons; first, that the plane was not designed to take the 8-cylinder motor, and the second is that the Signal Corps have some reason or other for deciding not to manufacture that type of motor.

Senator REED. That type of motor?

Mr. GUY. The 8-cylinder type.

Senator REED. But, anyway, as a result of these two conferences it was determined that neither the 8-cylinder nor the 12-cylinder Liberty motor was adaptable to the Spad machine?

Mr. GUY. That is correct.

Senator REED. But it was the engineers of this plant that convinced the Government engineers that they were wrong in using the Liberty motor?

Mr. GUY. Yes, for that type of machine.

The CHAIRMAN. How long was it after that that they canceled the contract?

Mr. WILLIAM A. MORGAN. I can tell you those facts.

Senator REED. Mr. Morgan, give us your information about that.

Mr. MORGAN. The first idea was to install the 8-cylinder Liberty motor in this machine. Then they decided, after consultation up here, with Mr. Mueller and our engineers, that they would place about 33½ per cent or install about 33½ per cent 8-cylinder motors in the Spad and 33½ of 150-horsepower Hispano-Suiza, and 33½ 175-horsepower Hispano-Suiza, then two days later——

Senator REED. When was that conference?

Mr. MORGAN. Sometime between the 20th and the end of September.

Senator REED. Is there any memorandum here that will show the date?

Mr. MORGAN. I think we have a memorandum in the letter of the executive committee to Mr. Coffin, dated November 22.

Senator REED. When was the contract canceled?

Mr. MORGAN. It was canceled November 7, election day. I happened to be in Washington on that date.

The CHAIRMAN. Was any reason assigned for cancelling it in connection with the Liberty motor?

Mr. MORGAN. Yes, I can give you almost verbatim the conversation and it was in his office. I went down there to see him, and spent the morning trying to see him, and while I was waiting in the afternoon, he sent for me and this was practically what he said, "Mr. Morgan. I really hated to see you because I have some disagreeable news." I had been given some intimation of what was coming because the promised delivery of the Hispano-Suiza motors had been held up so far that it looked as if we would never get them. So they switched from 150 to 175 and later 220 horsepower Hispano-Suiza, which latter engine was only on working drawings in France, and there had been none made in this country, and I had been given outside information that it would be probably late this summer or fall before they could get any. He said, "Mr. Morgan, I am sorry to tell you that we have to cancel the Spad contract, and the reason is that the Kaiser came over at Verdun and showed us a 2-seated fighting ma-

chine which makes obsolete the Spad, which is a single seater," and I said, "Colonel, that is a serious predicament for the Custiss Co. as well as for the Government, and for the Government first." He said, "What do you mean?" I said, "We have all our working drawings ready for production and have had for the last three weeks and are all ready for assembling and now the contract is canceled and that means that our organization will be all thrown to the winds," and he said, "It is a mistake that we could not foresee and can not help, and the consequences and the loss will be just as disastrous to the Government as to the company," and I said, "Personally I am obligated to the banks for the company to pay a million dollars mortgage on that plant in April, and we must have money to accommodate that or we will be bankrupt," and he called Maj. Shepler in, and one or two others in charge of the flying schools, and he said, "What can we give Mr. Morgan to keep that plant going?" and Maj. Shepler suggested that they give us the advanced type of flying plane, and he said, "Yes," and turned to somebody and said, "How many of those planes do we have to have?" which was evidently the JN4H, and he said, "576," and he said they wanted them by April 1, and he had a letter handed him by Maj. Shepler showing that the blue prints for the advanced type of training planes could not be completed by April 1, and I said, "We can give you an advanced flying plane for a test flight within 10 days," and he said, "We will ship immediately that afternoon, a 150-horsepower Hispano-Suiza motor and have a man take it to Buffalo," and they dispatched a man with that Hispano-Suiza model.

I telephoned Mr. Guy that I had promised a test flight within 10 days and wanted it with this 150 Hispano-Suiza engine for the JN4H machine. I told Col. Deeds I promised this test in 10 days and asked him what speed they wanted, and they said between 90 and 100 miles, and I asked them what landing speed, and they said the same as in the regular training plane. We made it from our own information in eight days and we made the official Government test in 10 days from that date, and it flew 95 and 6-10 miles, if I remember correctly, and the crew that came up here to see the test made—one of them made the remark, "We have no use for that plane because it is too damn easily handled," and when the report got back to Washington to Col. Deeds and Mr. Howard Coffin, they decided that they would take it and it flew so satisfactorily with a French aviator in the machine and he did all sorts of stunts, that they ordered 600 machines, and I believe that order has been filled. I have not been here since early in January.

Senator REED. This remark that it was too easily handled was in the nature of a joke?

Mr. MORGAN. No, it was because they wanted something more difficult for the men to handle. In the advanced type it was too easy compared with the regular training plane, and they wanted the boys to have something more difficult to give them more experience, but it had the desired speed, just a trifle more than $5\frac{1}{2}$ miles faster than the minimum speed required, and the same landing speed, and it fulfilled all the requirements.

Senator REED. Now, you have wandered away from the question of the desire to get the Liberty motor into this machine. What do you know about that, Mr. Morgan?

Mr. MORGAN. They said that this 8-cylinder Liberty motor was obsolete. As soon as it was completed, they said that it would not do.

Senator REED. When did they say that?

Mr. MORGAN. That was between the 1st and the middle of October. I think that date is mentioned in that report.

Senator REED. Why was it obsolete? Did it not have enough power?

Mr. MORGAN. Not enough power.

Senator REED. How much did it have?

Mr. MORGAN. I don't know.

Senator REED. But they had figured putting it into this Spad machine?

Mr. MORGAN. Yes, sir.

Senator REED. What I want to get at is this: I have a memorandum here and I am going to read it and see if it is a correct statement [reading]:

About the 15th of September, the Engineering Department was instructed to prepare for the quick production of drawings of type A.

Mr. MORGAN. That is the Spad machine.

Senator REED. I will continue to read. [Reading]:

Sample machines were to be sent us and these arrived and were assembled in the office of our North Elmwood plant on September 19.

Mr. MORGAN. That is correct.

Senator REED. (Reading:)

On September 2d, a crew of some 20 draughtsmen were started on the designs, and up until the shut-down of the work, from 30 to 35 had been constantly getting out the engineering production data.

Mr. MORGAN. That is right.

Senator REED. (Reading:)

When the work was first started, it was understood that we were to build the 120-horsepower type.

That was the understanding?

Mr. MORGAN. One hundred and fifty horsepower Hispano-Suiza.

Senator REED. It is 120 in here several times.

Mr. MORGAN. Mr. Guy can explain that.

Mr. GUY. The 120 is a motor of high compression and develops 150. It is sometimes known as 120 and sometimes as 150.

Senator REED. I will continue reading from this letter. [Reading:]

The foreign representative of the A type stated on September 22 that a telegram had been sent abroad the week previous for a sample 120 horsepower A type, and a set of drawings to suit. In the meantime, however, we were to redesign the 175 horsepower A type to accommodate the Liberty motor, and Washington was to send us a wooden model of the motor to apply.

Did you get that model?

Mr. GUY. I do not think that ever came.

Senator REED. (Reading:)

At that time decision had not been reached by the Government regarding what machine guns should be used. On September 25th Col. Waldon paid us a visit in connection with this subject, and stated that we were to build blank A type machines.

What do you mean by "blank" A type machines?

Mr. MORGAN. A blank number of machines. It was divided into three parts, and I was under the impression it was a third of each.

Senator REED. How much was the blank number of A type machines changed to?

Mr. GUY. 750.

Senator REED. With 120-horse-power Hispano-Suiza motor?

Mr. GUY. That is right.

Senator REED. And 175 horse-power Hispano-Suiza?

Mr. GUY. 750.

Senator REED. And of the A type with the 8-cylinder Liberty motor.

Mr. GUY. 1,500.

Senator REED. So there were to be 1,500 of these 3,000 that were to have the Liberty 8-cylinder motor. That was the situation on September 25. [Reading:]

On September 27 Col. Clark and Maj. Vincent paid us a visit to decide on the applicability of the 8-cylinder Liberty motor with the A type, but it was decided by them on that date that we stop all work on the Liberty motor layout and proceed immediately with the production of drawings of the 175-horsepower Hispano-Suiza A type, using Vickers guns in connection therewith. We were also requested at that time to do nothing further with redesigning for the 120-horsepower Hispano-Suiza A type.

That is a correct statement is it?

Mr. MORGAN. That is right.

Senator REED. So that it appears that on September 27 you had abandoned the Liberty-motor 8-cylinder proposition?

Mr. MORGAN. That is right.

On October 1 Mr. Morgan wired Col. Waldon for definite instructions about production of the 175-horsepower A type. On October 6 Maj. Horner and two engineers were at our plant and gave us decision to proceed with our designs on the basis of using the Marlin machine gun on those two types.

Is that correctly stated?

Mr. MORGAN. Absolutely.

Senator REED. (Reading:)

On October 2 Col. Waldon wired Mr. Morgan that as soon as the A type had been modified to receive Marlin machine guns, and had been approved by Col. Clark, Maj. Vincent, and Maj. Horner, we could proceed with the building of the first thousand planes.

Those planes up to that point were none of them to have Liberty motors. That was understood, was it not?

Mr. MORGAN. Yes, after that decision of September 22.

Senator REED. (Reading:)

By October 10 we had completed approximately 1,500 drawings on the 175-horsepower A machine. On October 11 Col. Clark wired us to have two standard Vickers guns in place of Marlin on the A machine.

Mr. MORGAN. That is right.

Senator REED. (Reading:)

By October 22 we had practically completed 1,875 drawings.

Mr. MORGAN. That is right.

Senator REED. (Reading:)

On October 27 Maj. Martin paid us a visit and the question of material specifications was settled.

Mr. MORGAN. Yes, sir.

Senator REED. (Reading:)

On October 31 Mr. Morgan wired Lieut. Emmons for a definite go-ahead on the A. Up to this time we had been releasing drawings to the tool-de-

departments for their work in connection with production, just as soon as the drawings were completed by the engineering department. We had also interviewed many vendors of various classes of materials to be used on the A; a general contract had been given to the Haskell Manufacturing Co. for all the veneer. On November 7 we were instructed by Mr. Morgan to hold up all work on the A so far as production was concerned, and throw the forces onto the designing of the B machine —

Mr. MORGAN. That is November 7?

Senator REED. Yes.

Mr. MORGAN. That is the date I was in Washington.

Senator REED. These conferences you referred to with Col. Deeds were of some length?

Mr. MORGAN. Yes.

Senator REED. (Reading:)

Just as soon as the A designs could be generally completed and the men transferred conveniently.

The B machine was what?

Mr. MORGAN. The Bristol.

Senator REED. The Bristol fighter?

Mr. MORGAN. Yes, sir.

Senator REED. That is the date of the cancellation of the Spad contracts?

Mr. MORGAN. Yes.

Senator REED. After the 27th day of September, which was the day that Col. Clark and Maj. Vincent were here and discussed the type of the Liberty motor and the applicability of the eight-cylinder motor as is referred to in this paragraph, which I read from this letter, did you have any further talk with these Army people about using the Liberty motor in these machines?

Mr. MORGAN. In the Spad?

Senator REED. Yes.

Mr. MORGAN. No.

Senator REED. It was dropped?

Mr. MORGAN. Yes.

Senator REED. It was dropped because the Liberty motor was not applicable, but there was some talk, as Mr. Guy has said, about trying to fit the 12-cylinder in?

Mr. MORGAN. Yes; but it was decided within a few days that the 12-cylinder would not fit in the Spad machine. It was built in such a shape that it could not be used in it.

Senator REED. What was the matter with the shape?

Mr. MORGAN. It was too large. It would slow down the Spad or else change the entire design of the plane which would reduce the speed.

Senator FRELINGHUYSEN. If it had been geared, would it have fit?

Mr. MORGAN. No.

Senator REED. What, in your judgment, was the real reason for abandoning the making of the Spad machine? Was it because you did not get the Hispano-Suiza engines in time, or was it because the Liberty motor would not fit into the machine, or what was the reason? Of course, I don't mean merely wild speculation. I mean any reason that you have based upon your conferences in dealing with Army officers.

Mr. MORGAN. It was said that the Kaiser by his use of the 2-seater at Verdun had made the single seater obsolete; but I never figured that that was just the reason. I figured that the Liberty motor would not fit in a Spad machine, and they had no other motor ready in sufficient quantities to place in the Spad machine if we produced Spad machines, according to our contract, which was to start January 1.

The CHAIRMAN. They did not have enough Liberty motors, did they?

Mr. MORGAN. No; and no other motors, and it had not been perfected enough to allow us to go ahead. We would have had planes galore and no motors to put in them. They only had 150 or 120 Hispano-Suiza motors that would be ready by the first of the year. As Lieut. Emmons told me when I was in Washington in October, the latter part of October, that they would not be able to give us any deliveries of that 175 horsepower Hispano-Suiza until March or April, and we had a contract for 3,000 Spad machines to be delivered in as nearly equal quantities as possible between January 1 and July 1. Of course, the heavier shipments would have been made in the latter months. We would have delivered the smallest quantities in January and February. We would have been able to deliver some of those machines in December. There would have been no Liberty motors ready and no Hispano-Suiza motors, more than 120 or 150, that would have been ready. You want a reason for everything, you say, and the reason we have for feeling that way is that the Spad machine is still being used over there, and from an officer who was over here a week ago, when he asked me why our Spad contract was canceled, and I told him the reason given by Col. Deeds, he said, "Well, the Spad machine is not obsolete, because it is one of the best types we have over there today," and I said to him, "That was the reason given to me, and that is the only reason I know of," but I said that I never believed that was the reason. I am not in the Curtis Co., and I am telling you what I believe. I do not want to "knock" anybody. But he also told me that night that Commander Westerfelt, who was stationed, I believe, by the Navy here at this plant; I saw him at a friend's house in the morning with his wife and he talked over this contract, and then in the evening, at a dinner, he said to me:

I saw Commander Westerfelt in charge of the field division of the Curtiss plant, and asked about the Spad contract cancellation, and he said it was the crime of the century.

Senator REED. Let me ask you this question: Did you have anything to do with the negotiations which led up to the making of the contract for the Bristol fighters?

Mr. MORGAN. Nothing in the final preparation of the contract, but it was all under way when I left for California on account of a nervous breakdown, and the details were practically all arranged. I left here on the 8th or 9th of January, and, I think, the contract was signed on the 10th or 13th.

Senator REED. In these preliminary talks which were had with you, was there anything said about the kind of motor that could be used in the Bristol fighter?

Mr. MORGAN. Nothing was mentioned except the Liberty.

Senator REED. They talked about the Liberty motor?

Mr. MORGAN. Absolutely.

Senator REED. Your Spad contract was canceled on November 7?

Mr. MORGAN. Yes, verbally, not officially.

Senator REED. That was enough to stop you mighty quick, of course, because you could not go on?

Mr. MORGAN. Yes.

Senator REED. Were you at that time, or how soon after that time, did you begin to talk about the Bristol fighter contract which finally you consummated on January 10, 60 days later? Did the talk about that begin at about that time?

Mr. MORGAN. Practically that same time. It was only two weeks from that date, the 22d, that we were down in Washington to see Mr. Howard Coffin and we presented this letter to him on November 22.

Senator REED. This letter that I have been reading from?

Mr. MORGAN. Yes, sir.

Senator REED. I think we had better put that letter in. Can you state from recollection whether you had been talking about the Bristol fighter even before November 7?

Mr. MORGAN. Yes, sir: we had, and that letter shows it conclusively, because in there it states that I gave them orders over the phone to drop all work on the drawings for the Spad and commence on the B machine, which is the Bristol.

Senator REED. Does this letter state when that was?

Mr. MORGAN. Yes, sir.

Senator REED. The statement in the letter which you pointed out is that on November 7 you were instructed to hold up all work on the A's so far as production was concerned, and throw the forces on the design of the B's. That is the Bristol machine. "Just as soon as the A designs will be generally completed and the men transferred conveniently," so that you had been talking about the Bristol machine even before this date of cancellation?

Mr. MORGAN. That is right.

Senator REED. And the only talk thereafter was about the motor to put into the Bristol machine was talk about the Liberty motor.

Mr. MORGAN. That is right.

Senator REED. And the proposition from the first had been to use the Liberty motor in the Bristol machine?

Mr. MORGAN. Yes, sir.

Senator REED. What type of Liberty motor?

Mr. MORGAN. The 12 cylinder.

Senator FRELINGHUYSEN. What was the object in sending the Spad to Dayton?

Mr. MORGAN. We never knew. We opposed it and we were criticised for doing it. We thought it should not be taken away from here, and sent to a competitor, but we were sure it was not for any reason of that kind.

Senator FRELINGHUYSEN. Is it there now?

Mr. MORGAN. I don't know.

Senator FRELINGHUYSEN. Who got it; what competitor?

Mr. MORGAN. The Dayton-Wright Co. I suppose it went to the McCook Field.

Senator FRELINGHUYSEN. Has it been utilized there in any way?

Mr. MORGAN. I could not tell you as to that.

Senator REED. I think you have stated your activities largely up to the Bristol fighter. I wish you would tell us in your own way the story of your work in getting the contract and beginning work; your troubles, if any, that you have had from the first with relation to this particular machine.

Mr. GUY. The negotiations for the order of this machine I am not overly familiar with on account of not having been implicated in any of them. I know more about the machine after the order was obtained.

Senator REED. Who obtained the order?

Mr. GUY. The order, I think, was largely negotiated for by Mr. Morgan.

Mr. MORGAN. Yes; I negotiated it.

Senator REED. Mr. Morgan, will you answer that part of the question which lies particularly within your knowledge?

Mr. MORGAN. After the Spad order was canceled, there was considerable negotiation back and forth as to what contract would be given the Curtiss Co. to take the place of the \$30,000,000 contract consisting of 3,000 Spads and 500 Capronis that was canceled, and from November 7, which was the date that contract was canceled, until I left here, about January 9, no definite contract had been received by us, but it was divided up to give us about 2,000 Bristol fighters, and when I left the talk was that they were to have 50 Capronis and 673 of the HS No. 1 boat, splitting the \$30,000,000 up as between the Navy and the Army. Finally, when I left, I think the idea of giving this company any Capronis was abandoned, it being stated by Col. Deeds that the reason they would not take any Capronis was that they had figured latterly on buying only the Caproni in parts and shipping them abroad, and having them assembled in northern Italy at a point very close to where the Italians were put to flight, so that they would have been assembled in Italy. So that canceled the Caproni proposition and at that time went to California, and the contract actually came in for 2,000 Bristol fighters after I left.

Senator REED. Are you not a director in the company now?

Mr. MORGAN. Yes; but I have never attended a meeting since December.

Senator REED. You have stock in the company?

Mr. MORGAN. No; not a share of stock.

Senator REED. Did you have an official interest in the company before you went away?

Mr. MORGAN. No; not since last November, I think it was, that I sold all my stock.

Senator REED. Who did you sell to?

Mr. MORGAN. I sold it on the market.

Senator REED. You don't know who bought it?

Mr. MORGAN. No.

Senator REED. So, at the present time, you have no interest whatever in the Curtiss Co., unless it is sentimental?

Mr. MORGAN. That is all.

Senator REED. That brings us up pretty well to the point where your information is limited about this machine. I will now ask Mr. Guy about that.

The CHAIRMAN. You sold your stock at a loss?

Mr. MORGAN. Yes; I sold my common stock at between 20 and 24. I was in Mr. Keys' office, one of the vice presidents in New York, and we were discussing a contract with the Navy, and a representative of the Navy said, "Mr. Morgan, some officer in the Navy thinks that the Curtiss Company is so and so," I have forgotten the remark—and I said "Well, I will show you that although I am vice president and general manager of the Curtiss Company, and have some stock in the company, I will not allow anything that I say or do for the company to be put in a way that will indicate a selfish interest," and I told them to sell every share of my stock, and he said that the market was low, and I said that I did not care; to sell every share.

Senator REED. I don't understand why you were selling it?

Mr. MORGAN. Simply because I did not want at that time to have anybody think that anything that I did or said on this contract or any other contracts with the Government would be for any personal benefit to me, and I wanted to be absolutely free.

The CHAIRMAN. This was after the cancellation of the Spad contract?

Mr. MORGAN. Yes.

Senator REED. There had been some remarks that there might be some profiteering or something?

Mr. MORGAN. He said that somebody connected with the Army or Navy in Washington had made some remarks about the Curtiss Co. and I said, They can not say that about me, because I told the Signal Corps at a meeting with them when we were awarded that \$30,000,000 contract that General Squier and the others there had agreed to finance this company for \$4,000,000 and the equipment for a million and a half, and give us this \$30,000,000 contract; and they said that they disliked to do it very much, but saw no way out of it, and they must have the Curtiss facilities, but it would establish a precedent by financing it and put them in rather an embarrassing position; and I said, "You don't know the Curtiss Co. or W. A. Morgan, if that is your stand. I will tell you that I will not put you or anybody else in an embarrassing position, and that we will finance it ourselves," and we did so; and I said that "If ever a time comes when you are not satisfied with the way the Curtiss Co. handles this contract, either in a financial way or any other, you can tell me and I will manage the company for you and take a commission in the Army or Navy, and take a dollar a year or nothing, just to show you that I want to be right in this thing." They had made some insinuations that they would commandeer the plant. I said, "You can not do that, because I refuse to put the Curtiss Co. in that position," saying that "we hereby offer it to the United States Government without a cent of cost for overhead or anything else, whether we get a dollar's worth of business from the Government or not," and they said, "We did not intend that"; and they also said to me, "Of course, we can get some one to run that plant for less than the Curtiss Co. and Col. Deeds," and Col. Waldon said that it could be done for 5 or 10 per cent, and I said, "I want to say right now the plant is yours." They said, "We can not do that," and I said, "Why do you use such tactics as that?"

Senator FRELINGHUYSEN. During the two months that you were waiting for these contracts, were contracts placed elsewhere?

Mr. MORGAN. With other concerns?

Senator FRELINGHUYSEN. Yes, sir.

Mr. MORGAN. That I don't know.

Senator REED. How much further ahead could this company have been with the work if it had not been for the lack of specifications, and had been given contracts and allowed to proceed?

Mr. MORGAN. On the Spad machine?

Senator REED. On the whole question of producing aeroplanes. What I want to get at is how near we have come to using up the natural facilities of the country in getting out aeroplanes.

Mr. MORGAN. It took from July 19 to September 19 to get that first contract signed, and then we started in immediately and we had all the blue prints ready when they canceled it on November 7—that is, the Spad contract—and they had not at that time given us the specifications for the Caproni. There is no question but what we would have had some production of Spads in the month of December, 1917, although our contract did not call for any deliveries until January, so I should say there was at least two full months of lost time. I don't say that we could have finished any large number in December, but our manufacturing facilities in the first 1-story plant were all ready by the first of October. The assembling we could not have commenced until about the month of November.

Senator REED. You say that you have lost two months in last year?

Mr. MORGAN. Yes.

Senator REED. How much does that mean of a loss in gross production? With this plant in full swing, in the swing it is now in, and it is not in full swing now, I understand you to say.

Mr. MORGAN. It is not.

Senator REED. What would be your production now? You were working to-day on things, and if you keep up this present program after a while you will reach a point where you will strike an average production.

Mr. MORGAN. On training planes, which we understood we were to build when we built this plant, we figure on a maximum of forty a day.

Senator REED. What would it be on all these other kinds of planes that you are building now—that is, the Bristol fighter and these big seaplanes?

Mr. MORGAN. I think probably Mr. Weber could give you that.

Mr. C. WEBER. The seaplane is equivalent to about two and one-half in actual labor and probable capacity to a Bristol. The Bristol, as we originally figured it, was about 33 per cent more than a training plane.

Senator REED. Could you give me an answer to my question now in some sort of concrete shape?

Mr. WEBER. Now, we are producing for the Navy at the present time; we are dropping about four a day. We should be producing at a minimum 15 Bristols a day out of this plant in addition to our boat program, which we anticipate will be five a day.

Senator REED. Would that also include some training planes?

Mr. WEBER. No; at the present time I am not figuring on any training planes. I am figuring on Bristols as they are to-day, not as we originally knew them.

Senator REED. Twenty planes a day—5 of the seaplanes and 15 of the Bristols?

Mr. MORGAN. Yes, of those particular types.

Senator REED. How have your dealings with the Army authorities been in the matter of getting orders and carrying on your work compared with your dealings with the Navy?

Mr. MORGAN. The Navy seemed to know what they wanted and they have never changed. The first conference we had with the Navy people after I came with the company, they outlined a policy of so many of these HS No. 1, one of the boats of which we are making a large number now, and also the H-16 and H-12.

Senator REED. These have the Hispano-Suiza engines in them?

Mr. MORGAN. No.

Senator REED. Why do you call them the H?

Mr. MORGAN. That is simply a Curtiss name for them.

Senator REED. What engine do you put in them?

Mr. MORGAN. Liberty.

Senator REED. Have they been tested out and are they a success?

Mr. MORGAN. I understand so; yes.

Senator REED. This committee has been through your plant and seen a very large number of planes in process of construction. What proportion of those are for the Navy? If you don't know, I will refer the question to Mr. Guy.

Mr. MORGAN. He will know better than I do.

Senator REED. I am wondering whether you have given us the complete story of your reasons for getting out of the Curtiss Co.—for selling your stock.

Mr. MORGAN. Nothing in the world excepting this insinuation which was made. Not his personal insinuation, but what he said had been said to him in Washington.

Senator REED. What were those things that he said had been said to him, in substance and effect?

Mr. MORGAN. Something to the effect that Admiral Taylor had sent him over to New York to see if he could deal with Mr. Morgan, of the Curtiss Co., and get together on a proposition that would be satisfactory, because Admiral Taylor understood that Col. Montgomery, of the Signal Corps, and Lieut. Commander Hunsicker said that they could not come to an agreement with Mr. Morgan on a contract on a basis for arranging a contract for boats for the Navy, part of this substitute contract, to take the place of the Spad and Caproni, which had been canceled; and I replied to their remarks that there must be something radically wrong with that, because Lieut. Commander Hunsicker had a perfect understanding and I could not believe it and would like to go to Washington and face him with it; and that will show that I do not care anything about the profits in the Curtiss Co.; and I turned right around to Mr. Keys and said, "You sell all my stock in the Curtiss Co."

Senator REED. Your idea was that you wanted to serve the Government, and if anybody thought you were working simply for profits you wanted to get out of that cloud?

Mr. MORGAN. Absolutely. Mr. Keys said, "You are foolish, Mr. Morgan. I think I know enough about it to know that anybody that figures that way now will think you only transferred your interests to a mutual friend." I said, "Of course, I know it is foolish

to sell out at this price, but at the same time I want to be absolutely out of it so I can be free"; and he said, "I think you made that clear in Washington."

Senator FRELINGHUYSEN. You were not connected with the Government in any way, were you?

Mr. MORGAN. No.

Senator REED. Let us go back to this question of the troubles that you had in the matter of the Bristol fighters. I am going to refer to that general question. I wish you would now state the transactions of the Government from the time that Mr. Morgan has discussed them and tell us what your troubles have been, if you have had any interferences or delays, what has been the occasion of them, and follow the entire proposition through.

Mr. GUY. After we had received sufficient definite information from the Government that we were to build the Bristol fighters we started to get all the information and data necessary to go ahead. The Government furnished us with a fuselage and some wings, and, I believe, a landing gear of an English machine which was sent over here for the purpose, or a similar purpose, of manufacturing, and told us at the time that we were to redesign the job to take a Liberty motor. We were subsequently informed that the engineering department of the Signal Corps at Dayton, located at Dayton, either then or subsequently, would furnish us with the design and we were to use this design and make such manufacturing drawings as we thought were necessary for our production.

Senator REED. If you were furnished with a model of a fuselage and wings, then what was the design to be, to change that?

Mr. GUY. The model had to be changed in order to fit the Liberty motor.

Senator REED. So, that while you had the fuselage and wings, etc., you still could not go ahead until you got the designs from the Signal Corps, which would mean a modification or many modifications.

The CHAIRMAN. You had to adapt it to a different engine.

Mr. GUY. Yes.

Senator REED. Can you give me some dates as you go along?

Mr. GUY. I might tell you my story of this in my own way and then, if you like, Mr. Mueller can state them.

Senator REED. Proceed. When you come to examine your testimony, however, if you can put in the dates or approximately the dates it will make it so much easier to understand. Of course, as we go through reading this long record—it is going to be very long—and then have to go back 200 or 300 pages it makes it difficult for us. So tell us in your own way and when your testimony comes you can refer to your memoranda and put in your dates.

Mr. GUY. We began receiving drawings from the Signal Corps, engineering department, and we very soon found out that the various parts would not fit together in the construction of the machine. This was learned by our engineering department in checking over the drawings, so finally in desperation we decided to build a model by hand with the best information we had furnished by the Signal Corps, engineering department. After a few weeks this job was completed. It was about the 1st of February, 1918. The machine was

built up by starting at the tail of the fuselage and building each station from the drawings furnished by the Signal Corps, and if the parts made from the drawings so furnished did not fit our men in charge of the work constructing this machine would take the part out in the shop and have it made to fit. After this machine was practically completed, we started to build 25 of these machines from the sample which we had hoped to get finished in the month of February. About the time we got in operation on these machines to produce them the Signal Corps decided they wanted to equip the machines, in addition to the regular fighting equipment, with bomb-dropping devices, camera attachments, radio equipment, aviators' clothing and heating equipment, and also oxygen tank equipment. In other words, they were trying to develop a machine which would perform most of the functions of the various machines that were used on the fighting front. This immediately held up production on the machines we were attempting to build waiting for the changes that were necessary in order to put on this various equipment, with the final result that up to date we have shipped but four Bristol machines.

Senator FRELINGHUYSEN. To Europe?

Mr. GUY. I think they have gone to Dayton.

The CHAIRMAN. With these added improvements?

Mr. GUY. No, not with all the added improvements, because subsequently from the time that they decided to first put them on they decided not to put them all on. The machine is now equipped with wiring for the radio equipment, and just how much of the other equipment can be attached to the present design I will not attempt to say.

Senator REED. If you had not been interfered with when the order was given you originally, if you had been then furnished with the specifications, how many of these machines would you have had out?

Mr. GUY. If we had complete data and detailed drawings when they decided to give us the order?

Senator REED. Yes.

Mr. GUY. If we had had all of the information necessary to proceed with the manufacture of this job at the time they first talked of giving us the order we could probably have produced by this time better than 500 machines.

The CHAIRMAN. Bristols?

Mr. GUY. Yes; Bristol fighters.

Senator REED. Five hundred by this time? What would have been your rate of production and how soon could you from this time on have completed the entire contract for 2,000?

Mr. GUY. By the middle or latter part of August.

Senator REED. Would that have been a machine according to your design or according to the Signal Corps' design?

Mr. GUY. It would have been a machine according to our design.

Senator REED. The one that you did work out from their——

Mr. GUY. The one that we would have worked out from the information that they would give us. All the information we need for the building of an aeroplane is the kind of motor they are going to put in it, about the speed they want, the equipment they want on it, and about the climb they want.

Senator REED. I am trying to get at another question. They stopped you producing and they directed you to produce a plane that had a very complete equipment, as you have described. You started to produce that character of plane and they then issued an order that you would produce a plane with only part of that equipment. Assuming that they had given the last order to you first, that is, for the partial equipment of a plane such as you are now producing, how much time would that have saved?

Mr. GUY. I should say offhand at least a couple of months.

Senator REED. What reason did they give after having directed you to produce the planes with all this complete equipment for going partially back to the original form, and requiring a plane that was only partially equipped?

Mr. GUY. I think they came to the conclusion that they could not build a machine that would perform all of the functions of several different types of machines.

Senator REED. What were all those functions?

Mr. GUY. A bombing machine, a fighting machine, and a reconnaissance or observation machine.

Senator REED. How about signaling?

Mr. GUY. I should judge an observation machine covers that.

Senator REED. You mean that the machine had to be equipped with wireless?

Mr. GUY. Wireless and camera devices. When I say observation I mean that to perform two functions, one of going over the enemy's lines and picturing their territory and the other of observing gun fire and signaling back whether they had made hits or not.

Senator REED. In other words, to put it as concisely as possible, they ordered you to construct a machine that would carry machine guns, that would have a photographic apparatus, that would have a wireless, that would carry bombs.

Mr. GUY. Yes.

Senator REED. And what else?

Mr. GUY. Aviators' clothing, heating equipment, and an oxygen tank for the aviators to use in high altitudes.

Senator REED. And all those were to be put on this machine and you stopped production to put them on. How long did you work at that before they told you to stop again?

Mr. GUY. I should say roughly six weeks to two months.

Senator REED. What did they involve in the way of changing your organization, your working organization, your method of production?

Mr. GUY. It practically held up our production while those changes were going on.

Senator REED. Did it involve changes in the wings and in the fuselage and all through?

Mr. GUY. Yes.

Senator REED. How long did you work at that before they ordered you to make the next change?

Mr. GUY. About six weeks or two months.

Senator REED. Can you give the dates later?

Mr. GUY. Yes, we can give you a chronological diary of what the changes were.

Senator REED. Now, when they gave you the next order modifying this order for the complete machines, what were you to put on the machines then?

Mr. GUY. I think Mr. Mueller, if you will permit him, can answer that question better than I, because he has been more familiar with the engineering data on that.

Senator REED. How many of these Bristol fighters are you engaged in making now?

Mr. GUY. A short time ago the Signal Corps released for production 400 Bristol fighters, and then they followed that release with another release for 400 more, making 800 altogether, but the first four of the second 100 were to be machines constructed according to Mr. Mueller's design, which you saw out in the shop.

Senator REED. Let us see; they gave you an order for 2,000. They held the order up in order to put on all this complete apparatus. Did they limit the number of machines you were to make then to less than 2,000 at that time?

Mr. GUY. I might modify my statement by saying that they first gave us a release for 25 machines.

Senator REED. That is to say, they gave you an order for 2,000, but it was not a complete order.

Mr. GUY. It was not released for production.

Mr. MORGAN. Specifications were not given.

Senator REED. When you say "release" that is a go-ahead order.

Mr. GUY. Yes.

Senator REED. Your first production order was for 25?

Mr. GUY. Yes.

Senator REED. When did you get that?

Mr. GUY. That was along, I think, in January. About the 24th of January, as near as I can remember.

Senator REED. So that your first order for these Bristol fighters, while it was a 2,000 order, was, in fact, an order that you could not do anything with until you got a go-ahead order and when you got your go-ahead order it was for 25 machines, and you got it about January 24, 1918?

Mr. GUY. That is right.

Senator REED. What was your next go-ahead order?

Mr. GUY. For 375, making 400.

Senator REED. When did you get that order?

Mr. GUY. March 28, 1918.

Senator REED. What was your next order?

Mr. GUY. Our next order was for 400 additional, with the first four to be built according to Mr. Mueller's design.

Senator REED. So that you have now an order on your books for 400 Bristol fighters to be built according to the design of Mr. Mueller?

Mr. GUY. No; only four to be built according to his design, and 800, less the four, to be built according to the Bristol design.

Senator REED. When did you get this last order?

Mr. GUY. April 29, 1918.

Senator REED. When you fill in the date, please state which of these orders was for the completed machine, and which of these orders was for the machine that had only part of this apparatus on, and what apparatus was to go on the machines. Now, you have to-day a go-ahead order for how many Bristol fighters.

Mr. MORGAN. 800, less the four.

Senator REED. The four are to be a modified Bristol fighter, to be made according to plant specifications gotten up by Mr. Mueller?

Mr. GUY. Yes; but we don't call it the Bristol fighter. We call it the C. B. We use the B as a designating name, because Washington was calling it the Curtiss Bristol.

Senator REED. How many of these Bristol machines have you actually now in production?

Mr. GUY. I believe that everything that we have released up to date is in production. I might say that approximately all of the orders for the 800 machines are released to the plant for production. I mean shop orders.

Senator REED. And they are in various stages, from the initial steps on some of these machines clear up to the completed, or almost completed, machines. Is that right?

Mr. GUY. That is correct.

Senator REED. How many of these Bristol machines have been completed?

Mr. GUY. 14 have been shipped, and there are probably another eight or ten machines pretty nearly finished.

Senator REED. Where have these 14 machines been shipped to?

Mr. GUY. I believe they have all been shipped to Dayton.

Senator REED. Is there a flying field at Dayton?

Mr. GUY. We have the McCook Field, which is really the governmental experiment field at Dayton.

Senator REED. Why were these planes shipped to the McCook Field in Dayton instead of abroad?

Mr. GUY. I believe the Government desired to experiment with the machines at that field.

Senator REED. How long will it take you to complete the work on these Bristol fighters as far as you have had go-ahead orders?

Mr. GUY. That depends entirely on how many changes they make.

Senator REED. I am assuming that they do not make any more changes. How long would they keep your shop at work?

Mr. GUY. Probably three months.

Senator REED. Would that keep your shop completely at work or would you run out of work in any part of it, and do you need other orders coming along to keep you up to capacity?

Mr. GUY. We need other orders to keep us working at capacity.

Senator REED. You need the other orders right away.

Mr. GUY. Some of the fabrication of the parts for these machines is practically completed, and that capacity could be devoted to other work.

Senator REED. In order to keep this big plant of yours at work to capacity, what additional orders ought you to have?

Mr. GUY. We ought to have a very substantial order for machines running up into the thousands of any approved type.

Senator REED. What is the effect upon the efficiency of your plant of not receiving a go-ahead order for the whole number of Bristol machines?

Mr. GUY. I should say our plant would probably work at less than half its efficiency.

Senator REED. So that the situation to-day in the plant notwithstanding the large orders that you have from the Navy, unless you

get new orders right away, you will not be able to utilize the entire capacity of this plant?

Mr. GUY. That applies to both Army and Navy.

Senator REED. At this point let me ask what proportion of the work now on the floor of your plant is Navy work?

Mr. GUY. I should say in answering that, that probably 75 per cent of it, from the results we are obtaining.

Senator REED. That is to say, three-quarters of the work of the Curtiss Co. has been on orders from the Navy, and you have now reached a point in your production, taking into account both the Army and the Navy orders, when you need more orders immediately in order to utilize this great plant.

Mr. GUY. Yes, sir.

Senator REED. Is it true now that in order to utilize this plant you must know a considerable time in advance what actual production you are to be required to meet in order that you may get your raw material, keep your workmen, and keep them employed from the point of entrance of the raw material at the front door to where the finished product leaves the factory at the back door? Is that right?

Mr. GUY. We should have at least four to six months' work ahead.

Senator REED. How much have you got ahead now for full plant capacity?

Mr. GUY. At the rate we are going our Navy order should be completed by the early part of October and our Bristol order, what we have to go ahead on, if there are no more changes, should be completed by September.

Senator REED. So that if your orders should be given six months in advance, you have already reached a condition of uncertainty as to the future which is detrimental to the proper utilization of the plant capacity?

Mr. GUY. That is true.

Senator REED. Why is it that you have done so much more work for the Navy than for the Army, and produced it so much more promptly.

Mr. GUY. Because the Navy has not radically changed its design since we got it into manufacture.

Senator REED. Did you have difficulty with the Navy in getting your plans in the first place, the same as with the Army, or did you get your plans promptly?

Mr. GUY. Well, we had difficulty in getting a contract to start with. We did not get the contract for the HS1 flying boats until about the 30th of November and the delays which we have had concerning the Navy contract were not due so much to radical changes in design but were due to a release or a go-ahead on a small number of a certain part of the boats. For instance, they would release radiators for, say, 25 boats, figuratively speaking, or a certain design of oil tank for a certain number of boats, and they would release a certain design of other parts of the boat for a certain number of boats, and there was at the outstart some delay in getting motors to properly assemble the boats.

Senator REED. That was the Liberty motor?

Mr. GUY. Yes.

Mr. MUELLER. The boat is originally a Curtiss design.

Senator REED. Which boat?

Mr. MUELLER. The HS1 boat we built for the Navy. We adapted the Liberty motor to it. We made a model and flew it and tested it. The re-design took place at our own plant under the eye of the Navy representatives here. The first sample was rebuilt and constituted the model on which the present production of HS1 boats was based, and from that time on we have had practically a go-ahead on that sample of machine which was originally a Curtiss model.

Senator REED. So that, to all intents and purposes, we may say that the Navy plane is a Curtiss production?

Mr. MUELLER. Yes, sir.

Senator REED. Except for the Liberty motor?

Mr. MUELLER. Yes, sir.

Senator REED. Who were the representatives of the Navy here?

Mr. MUELLER. Commander Westerfelt and Commander Richardson.

Senator REED. Have you had a British Navy contract previous to this time?

Mr. MUELLER. We had a contract with the British Admiralty for H16's.

Senator REED. What was the amount of that contract?

Mr. GUY. We had an order for 24 H12B's and an order for 75 H16's, which we obtained in August of 1917.

Senator REED. Did those bear any relation at all to these machines which were afterwards developed for the Navy?

Mr. GUY. Do you mean the HS1?

Senator REED. Yes. These boats built for England.

Mr. GUY. They had no relation to the HS ones, but in addition to the H16's and the H12's that we had on for the British Admiralty, we got an order for that same type from the Navy to be equipped with two Liberty motors each.

Senator REED. Have you built any of them?

Mr. GUY. We have built 29 of a total order for 34 H16's, and 19 of the H12C's.

Senator REED. What is an H16 and an H12C?

Mr. GUY. An H12C is a boat with a hull constructed similar to the HS1 one-deck hull, only much larger; that is, the hull is covered with cotton or canvas and painted. The H16 is a modified type of the H12C with the hull of a so-called fuselage construction with wood finish on the outside with linen on the rear part of the hull above the water line.

Senator REED. What engines?

Mr. GUY. Liberty engines.

Senator REED. What is this machine you showed us out there that carries two Liberty engines?

Mr. GUY. That is the H16.

Senator REED. That is a very large machine?

Mr. GUY. It is very large.

Senator REED. How many boats have you built?

Mr. GUY. For our Government?

Senator REED. Yes.

Mr. GUY. We have shipped 29.

Senator REED. How many more have you ordered now from the Navy?

Mr. GUY. We have five more on the original order of 34 to ship, and we recently got an order for 40 more from the Navy.

Senator REED. All those are very large machines?

Mr. GUY. Yes.

Senator REED. In a word, how far are those machines supposed to be able to operate from the shore?

Mr. GUY. I think they go out about 200 miles.

Mr. MUELLER. When throttled down they have a cruising capacity of from six or seven hours, depending upon the speed of the motors. The machines have a speed of about 97 miles per hour, but the machine has a cruising capacity around six hours.

Senator REED. I am not asking this question from a critical standpoint. I want you to tell us, to tell this committee, for the benefit of Congress and the country, what are the efforts and what are the difficulties connected with the production of this Bristol machine, what have been your troubles, why it has not been produced in better and larger quantities, and why if it is not a success, it is not a success.

Mr. GUY. In the first place our prime difficulty was in trying to install a motor in the Bristol plane for which it was not originally designed. This entailed considerable redesign of the machine, especially as it was originally attempted to save as much of the Bristol type as we could in making the new machine.

Senator REED. Why were you trying to save any particular type of machine?

Mr. GUY. Because we were instructed to do so.

Senator NEW. By whom was that redesigning done?

Mr. GUY. By the Signal Corps.

Senator NEW. And not by the company here, but done by them?

Mr. GUY. Well, it was done primarily by them and we had to inject some of our own design to make it practical at all.

Senator REED. In other words, you mean to say that the plans given you by the Signal Corps simply would not work?

Mr. GUY. In many instances.

Senator REED. As a whole they would not work and you had to make corrections in order to make it work? Is that right?

Mr. GUY. Yes.

Senator FRELINGHUYSEN. There was a lack of harmony between the engineering department of the Signal Corps and your engineering department. Is that not so?

Mr. GUY. I would not put it as a lack of harmony. It was a lack of cooperation and by not asking us to help them in every way we could.

Senator FRELINGHUYSEN. Then, from your experience you believe they were wrong in their designs; their designs were incorrect?

Mr. GUY. Yes.

Senator REED. Something was said this morning about the parts of the design; that it was not fitted; that is, they designed one part of the machine and then they would not fit together?

Mr. GUY. Yes.

Senator REED. When you came to put them practically into wood and steel and canvas parts would not fit, would not frame up. Is that right?

Mr. GUY. That is true.

Senator REED. Then you had to modify or change these measurements that they had given you?

Mr. GUY. We did.

Senator REED. I want to be sure that I am not mistaken about this, so I am going to tell it in my own language. If I understand you, what you mean to say is this:

That when they gave you the blue prints for this machine, and there are necessarily parts of a machine that have to be fitted to each other, that in some instances, the parts would not fit if made according to the plans and you could not assemble the machines.

Mr. GUY. That is true.

Senator REED. To what extent was that the case? Was it one or two isolated cases or was it a pretty common occurrence to run into that?

Mr. GUY. I think that possibly it might be better to have our technical man, Mr. Mueller answer that question, because he is better informed on that than I am.

Senator REED. Has the Curtiss company ever been asked by either the war or the Navy Department to design any kind of a plane; to get it up just so, and use their technical knowledge in producing something for the Government?

Mr. GUY. Not until quite recently.

Senator REED. How late?

Mr. GUY. Within the last 60 days.

Senator REED. Does that cover the four planes you have referred to that are now being constructed by Mr. Mueller?

Mr. GUY. That covers those four, and I might say in that connection that an offshoot of this company, the Curtiss Engineering Corporation, which is located in Garden City and which is composed of engineers who were formerly connected with this plant at Buffalo, have been given an order for four experimental airplanes with our own Curtiss motors. This order was placed, I should say, not over a month and a half ago by the Navy.

Senator FRELINGHUYSEN. I just want to ask a few questions in relation to this engine you have designed. Is that a new high-powered Curtiss engine?

Mr. GUY. Yes; I guess you might term it that. It is an engine with which we expect to develop 400 horsepower or better.

Senator FRELINGHUYSEN. What is its history and present development?

Mr. GUY. I think that the highest horsepower that we have obtained on the test stand has been 423 horse.

Mr. MUELLER. I have heard one rating over there of 438.

Senator FRELINGHUYSEN. Has that engine been offered to the Signal Corps?

Mr. GUY. No, it has not been offered as yet.

Senator FRELINGHUYSEN. They know of it?

Mr. GUY. They know of it now.

Senator FRELINGHUYSEN. They have ordered——

Mr. GUY. They have ordered four airplanes with this motor to be installed, and, I believe, two spare motors.

Senator REED. What kind of planes are those, combat planes?

Mr. GUY. They are fighting planes.

Senator FRELINGHUYSEN. Why was that engine not offered to the Government?

Mr. MUELLER. At the time that we were in the production of planes for the Signal Corps, the general impression all over was that Mr. Curtiss did not want to build machines according to the designs gotten out by the Signal Corps, which is also true of the motors. In order that the Signal Corps might not get the feeling that Mr. Curtiss was fighting the Liberty motor because it was not a Curtiss design, and because Curtiss engineers had not been consulted in its design, the Curtiss company saw fit to keep this engine covered up all the time rather than prejudice its relations with the Signal Corps by having them think that they had developed what they thought was a fine motor.

Senator FRELINGHUYSEN. In other words, you do not want to come in competition with the Government?

Mr. GUY. That is it. We do not want to throw any monkey wrenches into the gears, by promoting our motors in the face of motors which have been accepted.

(Whereupon, at 6 o'clock p. m., the committee adjourned until 10 o'clock a. m. June 4, 1918.)

AIRCRAFT PRODUCTION.

TUESDAY, JUNE 4, 1918.

**UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Buffalo, N. Y.**

The subcommittee met in the office of the Curtiss Aeroplane & Motor Corporation at North Elmwood plant of the company, at 10 o'clock, a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. B. A. GUY—Continued.

The CHAIRMAN. To what extent have you suffered delays by virtue of the fact that there has been an insistence that a certain type of flying machine should be accepted, and that into that there should be put a motor that was not primarily designed for that plane.

Mr. GUY. I think I can best answer that by stating that we have probably lost about eight months' production.

The CHAIRMAN. You said something yesterday in regard to a contract for Capronis which was afterwards cancelled. What reason was given for the cancellation of that contract or agreement.

Mr. GUY. I know of no reason which was given for the cancellation of the contract other than that there seemed to be some talk about the inadvisability of manufacturing that type of machine in this country, and I might state in this connection, that possibly Mr. Morgan may know of some reason that was given verbally in Washington, because he carried on all the negotiations down there.

The CHAIRMAN. Mr. Morgan, I will ask you what reason was given for the cancellation of that contract or agreement?

Mr. MORGAN. The only reason given me was to the effect that they decided that they would not want any bombing planes at that time.

The CHAIRMAN. What preparation, if any, did the company make for the carrying out and performance of that contract?

Mr. MORGAN. There were no plans given. The Caproni machine which was to have been shipped to this plant to make the drawings from never arrived here.

The CHAIRMAN. Did you go so far as to secure any material or throw together any working force for that particular contract?

Mr. MORGAN. No, there was none.

The CHAIRMAN. How much time intervened between the granting of the contract and the cancellation?

Mr. MORGAN. From September 19 to November 7.

The CHAIRMAN. What efforts did you make during that interval to secure the plans?

Mr. MORGAN. We continually and persistently asked for the machine, because I knew it was in this country, but they kept telling us that there was nothing definitely settled on it.

The CHAIRMAN. What was the contract price for the machines?

Mr. MORGAN. It was an estimated price of \$30,000 apiece.

The CHAIRMAN. Has any contract, apart from the Bristol contract which you now have, been suggested to your company for future production? In other words, has any step, even of a tentative character, been made to secure orders from the aviation section for any output of machines other than this pending Bristol contract? I am now referring, of course to fighting machines—on the part of yourself or on the part of the authorities in Washington?

Mr. GUY. So far as the company is concerned, we have continually for the last three or four months asked Washington for additional orders for machines, and not only for this plant, but our Churchill Street plant which is rapidly running out of work.

The CHAIRMAN. What type of machine are you making at this last-named plant?

Mr. GUY. Training machines, JNH machines and JN4D machines.

The CHAIRMAN. It is claimed by the authorities that they have a sufficient supply of training machines.

Mr. GUY. So they informed us, especially of the primary training type. They are anxious to get some of the advanced training type equipped with guns and bombing devices, and photographic machines and other similar equipment.

The CHAIRMAN. Has the Curtiss Co. devised a type of plane adaptable to this new engine?

Mr. GUY. The Curtiss Engineering Corporation, which is an offshoot of this company, has designed an aeroplane to accommodate the new Curtiss 12-cylinder motor, and has quite recently received an order from the Signal Corps, equipment division, for four of these machines.

The CHAIRMAN. That is the four you mentioned yesterday?

Mr. GUY. Yes; and these are now being built at the Garden City plant.

The CHAIRMAN. Where is the business office of the Curtiss Co., where the stock books and other insignia of official life are kept?

Mr. GUY. Right here.

The CHAIRMAN. This is the business office?

Mr. GUY. The principal office and active operating office of the Curtiss Aeroplane & Motor Corporation.

Senator FRELINGHUYSEN. I want to ask Mr. Morgan something in relation to his experience in Washington in the early part of his negotiations with the Government. Mr. Morgan, when did you come with the company?

Mr. MORGAN. July 16, 1917.

Senator FRELINGHUYSEN. What position did you occupy at that time?

Mr. MORGAN. Vice president and general manager.

Senator FRELINGHUYSEN. Were you interested financially in the company?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. What was the condition of the company at that time as to capital and surplus?

Mr. MORGAN. \$6,000,000 preferred stock, and, I think, around 200,000 shares of common stock, no par value, and \$4,000,000 of 5 and 10 year notes.

Senator FRELINGHUYSEN. What was the inventory value of the property of the company at that time?

Mr. MORGAN [referring to a balance sheet]. Do you mean the inventory of raw materials?

Senator FRELINGHUYSEN. I mean the inventory value of the property owned by the company, buildings, land, etc.

Mr. MORGAN. The land and buildings were \$1,415,000.

Senator FRELINGHUYSEN. And stock on hand?

Mr. MORGAN. Stock on hand and notes receivable, and inventory approximately \$6,250,000.

Senator FRELINGHUYSEN. That is \$7,500,000?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. Represented by \$6,000,000 preferred stock and \$4,000,000 outstanding notes, and 200,000 shares of common stock of no par value?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. At the time that you came with the company had they any Government contracts?

Mr. MORGAN. Yes, they had a contract for, I think, 600 JN4 machines.

Senator FRELINGHUYSEN. You have visited Washington in order to induce the Government to use the capacity of the plant, have you not?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. To secure orders?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. At that time had you built the new plant and enlarged the capacity?

Mr. MORGAN. No. The first visit I made to Washington was in July, on July 19, three days after I took charge here.

Senator FRELINGHUYSEN. Would you make a statement for the information of the committee in relation to your negotiations with the Government regarding the building of the new factory and what representations were made by, I presume, the Aircraft Production Board?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. Why you enlarged the factory, what representations were made to you by them; that is, make a plain statement of the history of your relations.

Mr. MORGAN. I took charge Monday, July 16, and Mr. Willys, the president of the company, was asked to come to Washington by Mr. Coffin, Col. Montgomery, Col. Waldon, and to bring with him myself and Mr. Guy and others, directors of the company. We went, and it was to give them a definite idea of what we could produce here in the Curtiss plants. They stated that they would want every plane that we could possibly turn out, and the outline on that day in the conference with Mr. Coffin, Col. Montgomery, Col. Deeds, and Col. Waldon—I think those were all the members of the board present—and as I say, was along the lines of getting an idea from us of exactly what we could produce. I had gotten together in the three or four

days I had been with the company from Mr. Guy, Mr. Weber, and Mr. Mueller, and others of the organization here, an idea of about the floor space, they figuring we could build and take on a large amount of this Government work on aviation, knowing as they had been told previously that the Government would want the Curtiss Co. to produce every plane they could possibly give them.

Senator FRELINGHUYSEN. Was any statement of that character made to you in writing?

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. That the Government wished to utilize the full capacity of the plant?

Mr. MORGAN. Yes, sir. The letter is on file here, dated July 19 or 20 by Col. Waldon.

Senator FRELINGHUYSEN. I should like to have a copy of that letter produced in evidence. Please go on.

Mr. MORGAN. I had obtained an option on two or three pieces of property which would expire on the coming Saturday and I had gotten an option from the Austin Co. at Cleveland, builders, for a certain amount of steel and buildings all erected, the regular standard construction, like our building is here, an option on which we had until Saturday of that week, for approximately 540,000 square feet of floor space, and I told these gentlemen on the Aircraft Board that while I knew the aircraft appropriation bill had not yet been passed we had read a draft of the bill wherein there was a \$640,000,000 appropriation, and while I understood they could not make any contracts or talk business, if they would give us a general idea of what they expected of the Curtiss Co., we would take the bull by the horns and go ahead and get ready a building to produce what they wanted. Col. Waldron said that the contract would probably be composed of 3,000 pursuit machines of the Spad type, and possibly a thousand of the Caproni or land bombing type of machines. and quite a number more, or about 5,000 0 x 5 engines for the training planes, and probably 1,000 more training planes but that they did not want to give the Curtiss Co. as many of the training planes as Mr. Willys and the other members of our board figured we should have; it was a Curtiss design, because they figured that the Curtiss Co. was the only company capable of turning out the more difficult machines like the Caproni or the bombing type, whatever they decided on, or the pursuit machine. There were no large companies in existence which had had enough experience to produce those machines, and they wanted the Curtiss Co. to build these more difficult types, and we said, "Supposing we can finish 3,000 of these pursuit machines in the time specified, namely, from January 1 to July 1, will you give us more of the training planes then?" And they said, "No; if you finish 3,000 Spad machines in the six months stated, we will give you that many more or as many more as you can possibly produce, and the same way in regard to the land bombing types."

We contended that we should have more of the training planes as that was our own design and we were ready to produce them very rapidly, but they contended, "No, we must take these planes," and we told them we would take whatever they wanted, of course. Col. Waldon then wrote a letter on the following day, Friday, giving us an outline of the conversation that took place between all of us present and confirming it and asking us to give them in writing a definite

understanding as to the floor space we had and the number of men per machine it took to manufacture them, and the number of feet of floor space.

Senator FRELINGHUYSEN. Did you do that?

Mr. MORGAN. We did.

Senator FRELINGHUYSEN. Is that on record?

Mr. MORGAN. Yes.

Senator FRELINGHUYSEN. I think a copy of that letter should be introduced. In other words, from the negotiations with the Aircraft Production Board, you were urged by them to increase the capacity of the plant, enlarge its capacity to meet the needs of the Government?

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. And they made definite representations to you that they would utilize that capacity?

Mr. MORGAN. They did. It is on record in those letters.

Senator FRELINGHUYSEN. Now, briefly, continue the story of your transactions.

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. Do you feel that the Aircraft Production Board fulfilled their promises to you to give you the orders that they had promised in these previous conferences?

Mr. MORGAN. No, I know they did not.

Senator FRELINGHUYSEN. Do you feel that they were obligated to do so?

Mr. MORGAN. Yes, they were obligated to do so, but as to whether the cancellation of that contract was due to any inclination on their part to handicap this company or the Government, or whether it was due to causes over which they had no control, it makes no difference to the position the Government is placed in in not having airplanes, and this company not having anything to produce. The results are absolutely the same. I don't pretend that they did it to wreck this company or anything of the kind.

Senator FRELINGHUYSEN. Then when did you commence your building operations to increase the capacity of the plant to meet the demands of the Government?

Mr. MORGAN. We signed the contracts for the property and I paid for it on Saturday of that week, as we had to exercise those options.

Senator FRELINGHUYSEN. And you commenced building?

Mr. MORGAN. On the following week.

Senator FRELINGHUYSEN. When did you complete your building?

Mr. MORGAN. I think the first building was completed and under roof on September 29. That is, the far building, where the manufacturing of all the machinery is done.

Senator FRELINGHUYSEN. You equipped it with machinery?

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. How much additional capital did that represent?

Mr. MORGAN. About five and one-half million dollars.

Senator FRELINGHUYSEN. Isn't it a fact that you have added to your capacity?

Mr. MORGAN. I don't know since then. It represented about five and one-half million dollars up to the time I left, which was early in January.

Senator FRELIGHUYSEN. I should like to have you state, Mr. Morgan, to the committee, your own information regarding these transactions. We would like to know what you believe the obligations of the Government were and what they should have done, and any statement that you make regarding their failure to carry out their promises in regard to orders for airplanes.

Mr. MORGAN. Well, it took from July 19, I think, the date I was first in Washington, to September 19 to get the first contract signed, two months. In those two months I presume I was in Washington probably a dozen times, sometimes twice in one week. One time Col. Montgomery called me on the phone at 12.15 and asked me to be in Washington the next morning early to meet him, and Col. Deeds and Col. Waldon were at his residence, and the only way I could get there was to take the Empire Express on the New York Central at 1 o'clock, in just half an hour, without any grip, and get the midnight train to Washington, because he was going away on a vacation that afternoon, and he had to get the matter settled, and I spent about two hours with those three gentlemen at his residence and we came to no understanding. I figured all the time from the draft of the aircraft appropriation bill that the Government could and would acquire land and buildings for this new or infant industry, and the Curtiss Co. had no funds from which to build buildings like we did. All the intimation I had received or any of our company had received from the conference with the Aircraft Board was that what they wanted was speed. Col. Waldon will bear me out in that. In all our conferences with the Aircraft Board we figured the Government would finance this building. We were never asked the question until the first week in August at a conference with the Aircraft Board, in which the Packard people were represented, the Wright-Martin and Fisher Body, and several others.

In going over the general form of contract one of the other companies asked for consideration to the extent of a million or two million dollars for new buildings and machinery, et cetera, in order to take care of the Government program they were figuring on, and one of the members of the committee figured that they should not ask for anything of the kind because the Curtiss Co. were building a plant costing five and one-half million dollars and had not asked for anything, and they turned to me and asked me if that was so, and I said that we certainly were expecting the Government to finance it because we had no means to finance it, and they told me they could not finance it, and I replied that if that were the case, it was absolutely according to our understanding that the Government had provided funds for such an emergency as this, and we would have to stop work on this plant and could not go ahead, and they advised me not to notify our people to stop work, and they would advise us later on.

Senator FRELINGHUYSEN. By letter?

Mr. MORGAN. No, verbally.

Senator FRELINGHUYSEN. Who made that statement to you?

Mr. MORGAN. I could not say offhand; either Col. Montgomery, Waldon, or Deeds.

Senator FRELINGHUYSEN. In other words, they authorized you to expand your plant to the extent of your—your capital investment, to the extent of \$5,500,000?

Mr. MORGAN. Yes, sir. Then they argued back and forth in various conferences with Mr. Willys and Mr. Keys, one of our vice presidents in New York being present with me, that the Government could not finance the plant, but that they would take it up with Secretary Baker and see what could be done, and the terms of a proposed contract were outlined some time in August, and Col. Montgomery stated to Mr. Willys, Mr. Keys, and myself that he had an appointment with Secretary Baker the following morning to get his O. K. on the terms of this contract and the financing of the entire proposition. We waited overnight and met Col. Montgomery and he advised Mr. Willys, Mr. Keys, and myself to the effect that he had seen Secretary Baker and that Secretary Baker told him it was O. K. as far as he was concerned but that he would be obliged to take the matter up as a matter of form with the War Industries Board, but that Mr. Willys and Mr. Keys need not remain over; that it was just a matter of formally taking it up with the War Industries Board and that I could remain over and settle the details of the contract. He dictated the terms of that contract to Col. Thompson and Mr. Harris, the attorney, and Mr. W. W. Montgomery, Col. R. L. Montgomery's brother, who is an attorney for the board, and the contract was drawn up, and I think there is a copy of it in the files here, whereby the Government was to finance the buildings and lands at actual cost, and all the terms of this contract.

Senator FRELINGHUYSEN. Is that contract available?

Mr. MORGAN. I think there is a copy of it here.

Senator FRELINGHUYSEN. This contract was never executed?

Mr. MORGAN. No, sir.

Senator FRELINGHUYSEN. They proposed that contract to you and you agreed to it?

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. Did they sign that contract?

Mr. MORGAN. No. It was just drawn up.

Senator FRELINGHUYSEN. A memorandum?

Mr. MORGAN. Yes; it was all typewritten, and, furthermore, to show you how they were absolutely convinced that that was the proper form, etc., they suggested that it would be necessary to have the State of New York pass a law whereby the Government could buy lands in the State of New York and they were afraid that it could not be done because the State legislature had adjourned for the season, but I suggested that I happened to know that the governor had called a special session to decide on some State proposition, and that I could go to Albany and see the governor, Gov. Whitman, and see if he would be willing to bring this matter up at a special meeting, and I went there at their suggestion and saw Gov. Whitman, and the attorney general of the State, and they both advised that it could be done. It was taken up and the law was passed giving the Government the right to acquire lands in the State of New York. Then, a week later, I was advised to come to Washington to sign this contract. I took our attorney with me to go over the details and after waiting nearly all day without seeing Col. Montgomery or the others, there were Col. Deeds and Col. Waldon and two attorneys and myself, they advised us that they could not sign this

contract; that the Government could not pay for the lands and buildings. I stated that it was very strange, that Col. Montgomery stated that the Secretary of War had passed on it, and advised Mr. Willys and Mr. Keys that they need not remain over, that it was all settled except the formality of attending to the final details of the contract, and then Col. Waldon and Col. Deeds remarked that the plant was twice too large and to cut it in half.

The CHAIRMAN. Could you give the month?

Mr. MORGAN. In August at that meeting. They said that the plant was twice too large and we had to cut it in half and we had to know the cost if we only built half of it. I said it is impossible to do that, that half of the plant was for assembly and half for manufacture; that about half the construction of the first building was up and the steel all ordered, and that it would be impossible to countermand it, and anyway it would not be a complete plant any way you figured if we did not have an entire plant, and they said it was twice too large, and I asked Col. Waldon how he arrived at such a conclusion if he knew anything about space required to build aeroplanes. He said "yes" it required about 43,000 square feet of floor space to build an aeroplane. I said no; it only takes about 41,000 square feet. You gave us to understand you wanted 40 to 60 machines per day and 40 would require 1,640,000 square feet, yet, we have only provided for 1,140,000 square feet in this plant; and the reply was, it is too large anyway, and they said we could not go ahead with the contract and have the Government pay for it unless they would have it appraised at the end of the contract, and the Government would pay the difference between the appraised value and what it cost, and I asked them who would be the board to make that appraisal, and they said a board consisting of three Army officers, and I said, that it was not fair, and it would be absolutely out of the question, and I said you must tell me whether we should go ahead with this plant, because the Curtiss Co. absolutely can not finance this plant, and they would not tell me to stop. so I went ahead, and they kept on with these arguments back and forth as to what we would do and not do; and we got this contract and it was found the work that we had to do would be only sufficient to keep this new plant going and the Government had purchased this plant, would we agree to use all the men necessary to keep this plant going full tilt to the detriment of the other plants, and I told them, yes, to the extent of every man in the plant, even to myself.

Senator FRELINGHUYSEN. What do you mean, "to the detriment of the plant"?

Mr. MORGAN. If there was not work enough to keep all plants going we kept the cost plus plant going, so as not to make the cost too high for the Government and I agreed to that, and finally they got ready to sign the contract and had a meeting at which Col. Squier and Admiral Taylor were present, and Col. Deeds, and, I think, Col. Waldon, and at that time, Maj. Fulois, Capt. Irwin, and two or three legal representatives, and Mr. Cable, the secretary of the board, and myself, and they said that they had decided they would give the Curtiss Co. the contract and pay for the plant, as they saw no other way out of it.

Senator FRELINGHUYSEN. They told you at that time that they would pay for the plant?

Mr. MORGAN. Yes.

The CHAIRMAN. Was it in August?

Mr. MORGAN. No; in September, along about the 10th or 12th of September.

Senator NEW. Who made that statement to you?

Mr. MORGAN. Mr. Howard Coffin, as chairman of the meeting. Gen. Squier then followed it up and said that they were going to do so although they disliked to do so because it was establishing a precedent by paying for a plant, and every Tom, Dick, and Harry would want them to finance their plants, and they wanted me to assure them that we would do everything possible to deliver the goods on time, and I told them we certainly would do that, and one or two others made remarks about how serious it was, and how we should appreciate the fact that the Government was going to pay for this plant and that it was going to put them all in a hole, and I said, "Gentlemen, if this has put the officers of the United States Government in an embarrassing position to pay for this plant, I don't know where we are going to raise the money, but some of the officers of the company will do so and we will not put you in this position, providing you will have it appraised, so that we will be protected," and I said I wanted a board composed of one Army officer and one representative for the Curtiss Co.; and they said that that could not be done, and some one suggested they should consult with the judge advocate and they did so, and Mr. W. W. Montgomery, the attorney for the board, was asked to go with one of the other members of the board to the judge advocate's office. He went to the judge advocate's office and came back in about 15 minutes stating that it was O. K.; that the judge advocate asked him when he presented the proposition, "Who thought it could not be done? Who thought it was illegal for the Curtiss Co. to have a representative on the board?" and he said, "Of course, it is all right." And so they decided that they could have an appraisal and the Curtiss Co. would have a representative on the board, and they thanked me as representing the Curtiss Co. for having let them off even after they had agreed to finance the buildings and land, and that the Government would buy the machinery and equipment and the contract was finally signed about a week later on September 19.

Senator NEW. You have that contract?

Mr. MORGAN. Yes; and that was the contract which was canceled on November 7.

The CHAIRMAN. You have reference to the contract for the machines?

Mr. MORGAN. Three thousand Spads and 500 Capronis.

Senator FRELINGHUYSEN. They practically authorized you to go ahead with the expenditure of \$5,500,000?

Mr. MORGAN. They did.

Senator FRELINGHUYSEN. How much additional capital since that time have you put into the plant?

Mr. MORGAN. I can not tell you.

Senator FRELINGHUYSEN. Can you answer that, Mr. Guy?

Mr. GUY. I don't believe I can without referring to my records.

Senator FRELINGHUYSEN. Do you believe that the Government has failed to act in good faith in these transactions with you?

Mr. MORGAN. No, I would not say it as broadly as that. I never saw any indication in that respect.

Senator FRELINGHUYSEN. We would like to have you make any fair criticism or opinion that you may have of it.

Mr. MORGAN. What we know and what we think we know are two different things, but all the indications to me were that the Spad contract could have been fulfilled because it was the only thing that could be made at that time and from the knowledge I have that the Spad is still flying over there successfully it seems as though that should have been gone ahead with, but, of course, we don't know what they would have done regarding the matter. It is my idea that the contract was canceled due to the fact that the Liberty motor would not fit in the Spad machine. Whether or not that is correct, I do not know.

Senator FREYLINGHUYSEN. Your opinion is that the reason for the cancellation was due to the fact that the Aircraft Production Board were more interested in the development of the Liberty motor than they were in the manufacture of the planes, and that they were willing to sacrifice this contract rather than to have it interfere with the use of the Liberty motor. Is that your opinion?

Mr. MORGAN. Substantially, but I would rather answer that they had committed themselves so strongly and possibly the Government to the Liberty motor that they had nothing to substitute, and if we had built Spad, which undoubtedly we would have done, they would have had no motor to put in it except the Liberty motor, and that was absolutely unfitted for use in the Spad machine, as they had admitted.

Senator FRELINGHUYSEN. Did the Curtiss Co. or did you ever suggest that the Liberty motor would be difficult to install in the Spad machine?

Mr. MORGAN. Not until we had a conference with Maj. Vincent and others. I did not personally. The engineers of the company did.

Senator FRELINGHUYSEN. At that time?

Mr. MORGAN. No; after the contract was signed. We did not receive the sample Spad machine here until September 19, which was the same time I signed the contract in Washington.

Senator FRELINGHUYSEN. At what time did you sell your stock?

Mr. MORGAN. Some time in November. I have the records of it and can find it.

Senator FRELINGHUYSEN. Did you have a very large investment in the company?

Mr. MORGAN. All told, I had of various kinds preferred stock, common stock, and bonds about \$250,000, a portion of the amount that the Willys-Overland Co. purchased of the Curtiss Co.'s securities. I think I had 5 per cent of it. The stock I referred to as having sold at that time was the speculative stock, the common stock.

Senator FRELINGHUYSEN. You have no stock in the company at the present time?

Mr. MORGAN. No, sir.

Senator FRELINGHUYSEN. You are a director of the company?

Mr. MORGAN. Yes; I do not think the by-laws of the company require a director to own any stock.

Senator FRELINGHUYSEN. Have you a copy of the stock book of the company here?

Mr. GUY. No; we have not.

Senator FRELINGHUYSEN. Have you a list of the present stockholders?

Mr. GUY. The last list of stockholders we had was furnished to us by our transfer agents in New York as of about January 1, which was a list of the preferred stockholders, and it was prepared for dividend purposes. We have no recent list of common stockholders and those records are all carried by the transfer agent in New York.

Senator FRELINGHUYSEN. Is there a voting trust agreement?

Mr. MORGAN. There is a voting trust agreement. This list of stockholders that I spoke of are voting as certificate holders. The voting trustees own all of the stock according to the agreement with the company.

Senator FRELINGHUYSEN. Who is your transfer agent?

Mr. MORGAN. The Central Trust Co. of New York City, and the registrar is the Franklin Co.

Senator FRELINGHUYSEN. How many stockholders own and control the company?

Mr. MORGAN. I don't believe I would venture to guess on that at the present time. The Willys-Overland Co. took over approximately a controlling interest in the company about July, 1917.

Senator FRELINGHUYSEN. Do they own control of the company?

Mr. MORGAN. I think that possibly Mr. Kepperly can answer that question better than I.

Mr. JAMES E. KEPPERLY. They do not own the majority of the stock, but they do own control of the company by reason of the fact that two of the voting trustees are Willys-Overland representatives, and they also own a large block of the preferred stock.

Senator FRELINGHUYSEN. Of the preferred or common stock?

Mr. KEPPERLY. A large block of the preferred and common stock.

Senator FRELINGHUYSEN. Does the preferred or common stock control the company?

Mr. KEPPERLY. The common stock controls it as to voting. I did not mean that the Willys-Overland Co. owns a majority of the common stock. Possibly the Willys-Overland Co. and the stockholders who were in that group might own a control. I do not know what an individual on the outside that you might term as one of the "Willys group" might have done with his stock. He might have sold it. The preferred stock also votes.

Senator FRELINGHUYSEN. Are you a vice president of the company?

Mr. KEPPERLY. Vice president and general manager.

Senator FRELINGHUYSEN. Is any one in the company connected in any way in an official capacity with the Government at the present time?

Mr. KEPPERLY. Not that I know of.

Senator FRELINGHUYSEN. Is there any one in the Willys-Overland Co. connected in an official capacity with the Government?

Mr. KEPPERLY. Not that I know of.

Senator FRELINGHUYSEN. Mr. Morgan, your transactions were with Mr. Coffin, Col Deeds, Col. Montgomery, Col. Waldon, and Maj. Shepler principally?

Mr. MORGAN. I never had any dealings with Maj. Shepler on the contract. The contract was signed by Gen. Squier, and the only other time I had a meeting with him was this meeting I referred to.

Senator FRELINGHUYSEN. All the negotiations were made by the men I mentioned?

Mr. MORGAN. Yes, sir.

Senator FRELINGHUYSEN. Were any of these men interested in any company manufacturing airplane engines, to the best of your knowledge and belief?

Mr. MORGAN. I was told that they were. I think one of the members of the board made the remark that Col. Waldon was in the Packard Co. but that he had told the officials of the Government that he did own a considerable quantity of stock in the Packard Co. but that, whoever it was, had told him that it was not necessary to sell it, and that that was known to every one.

Senator FRELINGHUYSEN. Among those gentlemen I have mentioned, was any one interested in any subsidiary parts; in supplying any of these engine manufacturers, to the best of your knowledge and belief?

Mr. MORGAN. I do not know.

Senator FRELINGHUYSEN. Was any one among those gentlemen with whom you had negotiations interested in any way with any manufacturing concern manufacturing airplanes?

Mr. MORGAN. I do not know. I simply understood that Col. Deeds was at one time, but that he had severed his connection with it when he took a commission in the Army.

Senator FRELINGHUYSEN. Do you believe the failure to finance the Curtis Co. was due to the fact that those in charge of negotiating the contracts were favoring any other airplane manufacturers who were your competitors?

Mr. MORGAN. No, I do not think so.

Senator FRELINGHUYSEN. You feel, then, in your negotiations with the Aircraft Production Board, that outside of their desire to develop the Liberty engine there was no favoritism shown?

Mr. MORGAN. I do not think there was.

Senator FRELINGHUYSEN. But you feel that the interests of the Government in procuring airplanes were sacrificed to the production of the Liberty motor?

Mr. MORGAN. I am bound to think that.

JULY 24, 1917.

Mr. SIDNEY WALDON,
Aircraft Production Board,
Washington, D. C.

DEAR MR. WALDON. Your letter of the 20th to Mr. John N. Willys, addressed to Buffalo, was received here Monday and has been forwarded to him. We are getting the information together that we can obtain here and are asking Mr. Willys to do the same from his end and forward it to us, and we will see that you get as prompt an answer as possible, but you will realize that to give it to you on a basis that will be of any service to you takes some time. We will certainly send it from here this week.

I want you to know that we are not only getting the information ready, but we are getting the buildings ready; have over 75 acres of land bought, and work has already commenced on the buildings, and there has been noth-

ing left undone to carry out the program outlined to you when in Washington. In fact, we have a larger area under contract than we even advised you we would have, both as to land and buildings, and you can rest assured that we are going to do our part to please you in getting out machines faster and in larger quantities than we promised.

I could not take exception to anything you stated in your letter, and I know that promises unfulfilled are worth absolutely nothing, in fact are worse than nothing, and you can rest assured that I would not allow myself to exaggerate our position or promise you anything in such times as these that I do not feel absolutely confident of delivering.

This proposition to us is not one of being "all hog," or simply to make money for the stockholders, but is a patriotic move on our part, and we have the greatest incentive in the world, in that we believe as we do, that we can be the means of assisting in ending this war, and you can rest assured that none of us will allow any personal or individual likes or dislikes, or gain, or anything else to creep in to prejudice the interests at stake. We realize to the fullest extent your position and the position of your fellow members on the board, to say nothing of the interests of the United States Government and the world at large in this matter.

Assuring you of complete cooperation with you to the end, I am,

Yours, very truly,

OCTOBER 31, 1917.

From: R. L. Montgomery, Colonel, Signal Corps.

To: W. A. Morgan, Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y.

Subject: Expenditures for new plant extension and equipment.

1. I am instructed by the Chief Signal Officer of the Army and Navy Department, after consultation with the Aircraft Board, to communicate with you on the following:

2. In view of the fact that a great preponderance of the orders and contracts in the Curtiss plants are for United States Government work, either for the Army or for the Navy; and in view of the further fact that it is necessary for the prompt completion of Government work that Curtiss Company's credit be kept on a high grade; and further that the Signal Corps at your request and upon the authority of the Secretary of War, has advanced payment on contracts; it is requested that before any extensions of plant or machinery are contracted for by the Curtiss Company the Government be consulted and its approval secured. At the present time, both the Army and Navy anticipate using the facilities of the Curtiss Company for plane rather than for engine building and believe it undesirable for the Curtiss Company to expend money at the present moment with a view of accumulating machine tools and other machinery for engine building.

3. The Government, naturally, does not wish to dictate the lines upon which a private company should conduct its business, but in view of the fact that the large preponderance of the work of the Curtiss Company is for the two branches of the United States Government, it feels free to make this request. It is quite possible that at some time the facilities of the Curtiss Company could be used to a certain extent for engine building, but at the present moment it is most desirable that its entire resources be used in plane production.

By direction of the Chief Signal Officer.

R. L. MONTGOMERY,
Colonel, Signal Corps.

NOVEMBER 10, 1917.

COL. R. L. MONTGOMERY,

Equipment Division, Signal Corps,
Washington, D. C.

DEAR COL. MONTGOMERY: Replying to your letter of the 31st regarding expenditures for new plant extension and equipment,

I think I understand what you are referring to, but the only new plant we are figuring on is to take care of some additional boat business for the Navy and for which they anticipate making us an advance payment of about \$100,000.

We are not figuring on any additional equipment for motors. We are shut-

ting down our old Elmwood Avenue Plant soon, where we make our V-2 motors, even though we consider it too bad and really a mistake to do so, but, if the Government does not want these motors (which are greatly improved now over what they were), there is certainly no object in our continuing it and try to force them to take something they don't want, but we certainly are not going to say any more on that subject.

We have practically developed, however, a motor that we feel is going to be an exceptionally good one, but we are not going to put up any additional plant extension or anything of that kind for it.

Yours, truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
Vice President and General Manager.

JULY 20, 1917.

Mr. JOHN N. WILLYS, *President, Curtiss Aeroplane Co., Buffalo, N. Y.*

DEAR SIR: This is to confirm the substance of our conference of yesterday, at which the following were present:

John N. Willys, J. W. Scott, Wm. A. Morgan, B. A. Guy, K. B. MacDonald, C. M. Keys, J. K. Mitchell, H. E. Coffin, E. A. Deeds, R. L. Montgomery, S. D. Waldon.

OX5 engines.—You stated that delay in payment of bills had largely affected the output of the Hammond sport plant of OX5 motors and that the new financing accomplished would greatly improve deliveries from now on; that you had delivered 32 engines this month to Toronto and had 70 already installed in JN4A's for delivery to the Army.

We want to make it quite clear that our joint obligation to Canada to deliver 90 motors this month must be fulfilled.

We have several times asked for an estimate of the output from Elmira, Hammondsport, and Toledo of OX5 engines, in order that we could make out estimates of delivery of complete machines to flying fields, and so that the other departments of the Signal Corps could map out their work accordingly. Please let us have these estimates by months to July 1, 1918, just as soon as possible. These estimates to cover your entire output and we to deduct therefrom the requirements of the British and of the Navy.

It is our understanding that the Curtiss Co. gave you some time ago an order for 4,500 OX5 engines at \$2,100, and that, when funds are available under the large appropriation asked for, you desire a contract, either directly between the Signal Corps and the Willys-Overland Co., or indirectly through the Curtiss Co., for those engines, in order to protect you in your plans for their production. As I told you yesterday, while the board as a whole has not acted upon this matter, all the civilian members are familiar with this situation and are ready to make this recommendation as soon as funds are available. In the meantime, it would be well for you to decide how you would want a contract made, directly or indirectly, and arrange the matter of its details with Mr. Montgomery of our board.

JN4A planes.—I advised you of the criticism that had reached us regarding the flying qualities of the JN4A machine and the desire of this board and of the Signal Corps to have the factory change over to the JN4D at the earliest possible moment. We understand this can probably be arranged for at about 200 machines. You estimate that the 1,000 order covered part by contract and part by letter will be completed before the first of the year. Please give us your estimate by months of deliveries, having in mind meeting the Canadian requirements for engines as they are known to you. Your desire to continue the JN production after January 1 at a rate that will yield 1,000 machines in six months for the purpose of providing a parallel line of work to combat orders, so that you may work some portion of your organization from one to the other as the necessity may arise.

JN spares, etc.—It has been necessary for us to give to the Sturtevant Co. an order for plane spares in order that we might make immediate use of their facilities and at the same time provide for an enlarged requirement, as indicated to us by the experiences in Canada and abroad. We want them to go ahead on the JN4D parts and we have your assurance that you will aid us in this matter. Occasionally it will be desirable for us to send to you others desiring to build plane spares, or having facilities to produce the combat plane

in small quantities. From now on we will endeavor in each case to communicate with you in advance before definite arrangements are completed. We appreciate your willingness as expressed yesterday to cooperate with us in connection with such orders of this kind as it may be necessary to place.

V 2-3, V 2-10 motors.—We understand your situation on these motors and the necessity of knowing prior to August 1 about keeping these in production and to what extent. We cabled Europe on this matter and will advise you immediately upon receiving advice. In the meantime, please give us a statement of your situation as to these engines, showing your own factory order and against this the number that will be required to meet the Army orders, the Navy orders, and the balance—deficiency or surplus—as the matter stands.

R-4 and R-6.—We understand you are going ahead with the Rubay Co. and the Baker-Rauch-Lang Co., starting them upon the two orders recently given you.

Land bomber—heavy type.—We are going to want a large number of heavy bombing for both daylight and night work. Your own experience with the H-12 flying boat makes us look to you for the largest part of production of these machines. It is for this reason that we have urged as strongly as we have for you to let go of the R-4 and R-6 and to plan by the first of the year to get your production of JN's to the minimum, so that we could obtain from you the types which are so important in our program and so much more difficult to obtain. You are making now three per week of the flying boat, but estimate you can equip for very much larger output if given time in which to prepare. A thousand of these heavy bombers would mean 40 per week from January 1, which is a very large contract in itself and one which I am afraid you may have underestimated the difficulty of accomplishment. At the present time we have neither the design of plane nor the engine it is to take, but are expecting advice within a few days as to what our commission in Europe has decided upon and samples, etc., as soon as they can be forwarded.

Planes for Europe.—You are to take up with your organization and write to us the best plan you can evolve for delivery on 3,000 completed fighting machines and 1,000 completed land bombing machines of the heavy type. You are to consider particularly ways and means for manufacturing all the wood and metal parts here, boxing them and shipping to Europe for assembly in your own or Government plants over there.

We want to know what would be involved in the way of floor space, equipment, and employees to take care of the assembling of 500 pursuit machines per month and of 100 land bombing machines. We have asked for these specified quantities because we can then multiply the figures and ascertain the size of the problem ahead of us if our entire program is taken care of this way.

In making this report please give us the relative shipping space that would be occupied by 100 of these pursuit machines, built on this size and packed as economically as possible, as against 100 of the same machine with the parts crated and boxed with the final stages of manufacture to be completed across the water.

Pursuit machines.—We expect before the 1st of August to have a simple pursuit machine with all necessary drawings, specifications, bills of material, etc., which we will want duplicated in large quantities. You estimated yesterday that you could produce, in addition to the other types of planes, 3,000 of these between January 1 and July 1, if given the go-ahead August 15. These board will recommend that you be given orders for every single plane meeting the military requirements and of the combat types indicated that you can possibly produce during the period mentioned.

Sunbeam engines.—We cabled to our representatives in Europe to find out whether the Hispano-Sunbeam of the approximate 200-horsepower will be acceptable as an alternative for the 200 Hispano-Suiza. Upon receipt of this it would be very desirable if you could telegraph us a schedule by months as to what you think it would be possible to obtain from next November to July 1.

Program.—We discussed at our meeting a program which you felt you could fulfill and which is reproduced below :

The Curtiss Co.'s estimate of output from July 1, 1917 to July 1, 1918 (program July 20, 1917).

	Planes.	Engines.
TRAINING JN4D.		
July 1 to Jan. 1.....	1,000	} 5,000
Jan. 1 to July 1.....	1,000	
PURSUIT.		
Jan. 1 to July 1.....	3,000	.....
HEAVY BOMBING.		
Jan. 1 to July 1.....	1,000	.....
Total, United States Army.....	6,000	5,000
Estimated British requirements of OX5 engines.....	.....	3,000
Grand total.....	6,000	8,000

Results.—The Aircraft Production Board is interested only in results. It is one thing to make estimates and another to deliver. As stated to you yesterday, the Curtiss Co., has a reputation yet to make for living up to schedule. I want to take my hat off to the organization in Buffalo, prior to your going with the company, who had the nerve to bet their own money on their own judgment and without Government orders, but only on verbal assurances, went ahead and made the necessary preparations to give us machines this month. At the same time, I have found a quite general impression that the Curtiss Co. has always estimated larger than it could produce.

In this present situation we dare not fall down. Our board will approve such a program as the above the moment it is assured that you can deliver the goods. What we want is not newspaper publicity about what you expect to do, but such a statement of your plans as will carry conviction that the job can be done. Give us some facts about the producing capacity of the Cutler Desk Co. in floor space, and men per airplane; the producing capacity of your present assembling plant on floor space, and men per machine; the producing capacity of your sheet-metal plant on floor space, and men per set of fittings. Measure these known quantities against your future progress and let us see whether it looks feasible from the standpoint of floor space, number of men required, and time allowed to secure and train the men, get the materials, and have the whole machine running smoothly.

When we come to the actual placing of orders, it may be desirable to not order 3,000 pursuit machines in one lump, but to place the order in lots of 500 so that any slight changes suggested by European experience might be incorporated at the end of any lot of 500 or 1,000.

All of the machines indicated on the above suggested program and many more are required in the schedule laid down by the Joint Army and Navy Technical Board. We are going to reserve this much of our program for you, but before presenting this program to a meeting of the full board for approval, we must have something fairly definite and tangible to indicate that the estimate of your production capacity is based on such facts as give reasonable assurance of its accomplishment.

Please supply us with a statement of this kind as early as possible.
Very truly, yours,

AIRCRAFT PRODUCTION BOARD.

STATEMENT OF GEORGE H. MUELLER, CHIEF ENGINEER OF THE CURTISS AEROPLANE & MOTOR CORPORATION.

The CHAIRMAN. What is your age?
Mr. MUELLER. I will be 40 on my next birthday.
The CHAIRMAN. Where were you born?
Mr. MUELLER. Chicago.

The CHAIRMAN. You are a native citizen?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Your parentage is native also?

Mr. MUELLER. No, sir; my father was born in Germany and my mother was born in Germany. My father came over here at the age of, I would say, between 11 and 15 years, and my mother at the age of 3 or 4. My grandfather, however, on my father's side died in this country the week that I was born. My people on my father's side have gone back and forth. My father, of course, was an American citizen and was raised in this country by an uncle, my mother's people; my grandfather on my mother's side was an officer in the Army under the King of Hanover, and when the Prussians took over Hanover, he refused to serve and was smuggled out of Germany in a box. He served in the Union Army in the Civil War after reaching America. These grandparents on my mother's side were decidedly anti-Prussian.

The CHAIRMAN. What is your profession?

Mr. MUELLER. General commercial engineering work.

The CHAIRMAN. How long have you been connected with the Curtiss Co.?

Mr. MUELLER. About 14 or 15 months.

The CHAIRMAN. Prior to your connection with this company, with whom were you employed?

Mr. MUELLER. The Jeffrey Manufacturing Co., Columbus, Ohio.

The CHAIRMAN. Producing what?

Mr. MUELLER. All classes of mining machinery, conveying and lifting machinery; transmission machinery, which entailed mechanical engineering, electrical engineering, civil engineering, and mining engineering.

The CHAIRMAN. You came to the Curtiss Co. then about the time of the declaration of war between Germany and America?

Mr. MUELLER. I came to the Curtiss Co. before the declaration of war, on March 1, 1917; the date I arrived here was the 12th of March, 1917.

The CHAIRMAN. Had you prior to that time had any mechanical engineering experience regarding aviation motors or machinery?

Mr. MUELLER. Not aviation motors, no; but I had a great deal to do with internal combustion engines in connection with gasoline locomotives.

The CHAIRMAN. Which, of course, is the principal engineering feature of the aviation motors?

Mr. MUELLER. Years ago, in California, I was considerably interested in rotary combustion engines.

The CHAIRMAN. With what plant of the Curtiss Co. were you first connected?

Mr. MUELLER. I was located at the Churchill Street plant, but I was connected with all the plants of the Curtiss Co. when I came here.

The CHAIRMAN. But the present plant was not then in existence?

Mr. MUELLER. No, sir.

The CHAIRMAN. You were the engineer then when the contract which has been referred to here for the construction of 3,000 Spad planes was obtained from the Government?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Did it fall to your lot to devise the plans from the model which the Government sent here?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. How completely did you do that?

Mr. MUELLER. Just as completely as was possible with the information at hand pertaining to what equipment was to go into the machine. In other words, we had completed all the engineering drawings, specifications, releases, cards, etc., and the complete machines with the exception of the armament, and we did not have the final word from the Government as to just what armament would be used.

The CHAIRMAN. What was done as to providing materials for the construction of this plane in the interval between your securing the contract and your notification that the Government would not continue the contract?

Mr. MUELLER. We had given to our production departments and to our purchasing departments a list of various kinds of raw material for the fabrication of the Spad machines.

The CHAIRMAN. So that you were prepared to produce it in quantity as soon as the Government would let you go ahead?

Mr. MUELLER. Yes, sir; and we had also given to the shop here a number of drawings in the early stage which they were using in getting a line-up in the production of tools, jigs, fixtures, etc.

The CHAIRMAN. What information did the Government give the company concerning the engine, or the type of engine, which it was proposed to put into these machines?

Mr. MUELLER. The model machine arrived here with a 220-horsepower geared-down Hispano motor. The question was as to what motor was to be used in the accepted machine. There was a question as to whether or not the 150-horsepower Hispano, or the 220 Hispano, or the 8-cylinder Liberty motor would be used. We had our engineers making layouts of the three different installations of motors in this Spad machine. A conference was called on September 27, when Col. Clark and Maj. Vincent paid us a visit to decide on the applicability of the 8-cylinder motor with a Spad.

The CHAIRMAN. Who is Col. Clark?

Mr. MUELLER. He was the chief engineering head of the engineering division of the Signal Corps, at that time located at Dayton or Washington. They decided that the Liberty motor was not fitted to the Spad machine, and we were instructed to proceed immediately with the designing of the machine for the 220-horsepower Hispano motor, and to also stop the re-designing to accommodate the 150 Hispano motor. Mr. Curtiss was present at the time these two gentlemen from the Signal Corps were here.

The CHAIRMAN. This then led to the suspension of all further work upon the design with which the 150-horsepower motor was to be used.

Mr. MUELLER. And also the Liberty motor.

The CHAIRMAN. You now speak of the 8-cylinder Liberty motor, do you not?

Mr. MUELLER. There was an 8-cylinder Liberty motor.

The CHAIRMAN. That was the one which was first the subject of consultation?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. What was your next step?

Mr. MUELLER. On the decision to finish up the designs, using the 220-horsepower Hispano motor, I had our whole force of about 35 or 40 men continue along that line, using at that time Vickers guns, 1,000 of which we understood would be supplied to us by a foreign Government. Vickers guns were not in production in America at that time. To get a definite go-ahead on the 220-horsepower job, Mr. Morgan wired Col. Waldon on October 1. On October 6 Maj. Horner and two other engineers, who were then a part of the Ordnance Division, were at our plant and reversed the decision to use Vickers guns, and requested us to get out designs on the basis of the Marlin guns.

The CHAIRMAN. Did that also require a change in the plans for the plane?

Mr. MUELLER. Yes, sir. On October 2 Col. Waldon wired Mr. Morgan that as soon as the Spad had been modified to receive the Marlin machine guns, and the layout had been approved by Col. Clark, Maj. Vincent, and Maj. Horner, we could proceed with the building of the first 1,000 Spads. By October 10 we had completed approximately 1,500 Spad drawings for the 220-horsepower machine.

Senator NEW. Had completed the drawings?

Mr. MUELLER. Yes. We had completed about 1,500 drawings applying on these 220-horsepower Spad machines.

The CHAIRMAN. Do you mean that you had drawn 1,500 units of a plan for that machine?

Mr. MUELLER. Yes.

The CHAIRMAN. About how many units are there?

Mr. MUELLER. About 2,500 or 2,600 drawings required to complete the Spad machine.

The CHAIRMAN. You had then more than half completed the plans for the machines?

Mr. MUELLER. Yes. It was on October 11th that Col. Clark wired to use two Vickers guns in place of the Marlin guns.

The CHAIRMAN. Did that have the effect of making changes in another direction?

Mr. MUELLER. It reversed it back. We did not destroy the drawings, but it meant winding up our details again on the Vickers machine guns.

The CHAIRMAN. Did Col. Clark assign any reason for the change back to the Vickers?

Mr. MUELLER. No, sir. By October 22, we had completed approximately 1,875 drawings.

The CHAIRMAN. For the planes last ordered by Col. Clark?

Mr. MUELLER. Yes, sir. Just about that time we were ready to conclude with the shops. We had been given a list of the material specifications as were used by the French in building the Spad machine. We endeavored to apply American materials, naturally, to this American-made Spad. It was necessary throughout to get a list of the American materials which would coincide with the materials which the French had used in building the Spad. On October 27 Maj. Martin, who is an assistant to Col. Clark in the engineering department at Dayton paid us a visit and settled the question of

what American materials should be used for the material list of the Spad specifications. On October 31st Mr. Morgan wired Lieut. Emmons for a definite go ahead on the production of the Spad.

The CHAIRMAN. Who is Lieut. Emmons?

Mr. MUELLER. Lieut. Emmons. I do not know his relationship, but he was acting as a release medium as far as we knew on production at that time.

The CHAIRMAN. Did you get any instructions from Lieut. Emmons?

Mr. MUELLER. No, sir.

The CHAIRMAN. Proceed with your chronological statement.

Mr. MUELLER. Up to this time we had been releasing drawings to the tool designing departments for their work in connection with production. Just as soon as the drawings were completed by the engineering department we released them. We had also interviewed many vendors of the various classes of materials to be used on the Spads. We had also given our production departments practically complete lists of all materials that were necessary for the production of the Spad. It was on November 7 that I was instructed by Mr. Morgan to hold up all work on the Spad as far as releasing for production was concerned, and to throw the designing force over on the Bristol machine; just as soon as the Spad designs could be generally wound up and the force transferred onto the work without keeping them idle. At that time we had completed approximately 2,634 drawings. We had turned over to our blue printing and record divisions for distribution to production 1,959 of those drawings, with all the complement data. We had also turned over what are known as 350 standard tracings and release cards.

The CHAIRMAN. Did these standard tracings and release cards refer to the Spad machines?

Mr. MUELLER. Material used on the Spads. We retained in the engineering department some 315 tracings which were checked, all of which pertained to the gun arrangement or parts of the fuselage where the gun and the fuselage were tied together, and that lot of drawings were not released. In fact, they were not finished up because we were still lacking data on the guns which the Signal Corps had failed to give us a definite decision on at the time we shut down work.

The CHAIRMAN. Is that the last work done on the Spad in your department?

Mr. MUELLER. We probably spent about a month in just winding up generally during the time I was transferring the force on the Spad and to get the work on the Bristol started.

The CHAIRMAN. At whose expense was the making of these plans, the preliminaries of securing material, etc.

Mr. MUELLER. I do not know.

The CHAIRMAN. You do not know what the contract provisions were?

Mr. MUELLER. No, sir.

The CHAIRMAN. Your department was not concerned with and did not come into contact with that?

Mr. MUELLER. No, sir.

The CHAIRMAN. Did you ever in writing or orally call the attention of anyone in the service of the Government to the relation or possible relation between the Liberty motor and the Spad plane?

Mr. MUELLER. Yes, sir; at the very outset.

The CHAIRMAN. What was your comment?

Mr. MUELLER. That the Liberty motor, 8 cylinder, was not applicable, and the evidence was right there on the date of the conference with Col. Clark and Maj. Vincent.

The CHAIRMAN. That was in September?

Mr. MUELLER. That was on September 27.

The CHAIRMAN. Had you then a model of the Liberty 8 here or the drawings?

Mr. MUELLER. I think we had a wooden model at that time of the 8-cylinder motor.

The CHAIRMAN. Please state for the information of the committee, as concisely as you can, just what your statement to Col. Clark was upon that subject.

Mr. MUELLER. I do not know that I made any statements. I merely asked them to take a look.

The CHAIRMAN. Tell us what occurred?

Mr. MUELLER. They realized that the weight of the Liberty as compared with the Hispano motor was a serious problem. The contour of the Liberty motor did not lend itself to the streamlining of the machine as did the Hispano motor, which was in it, and we would have to have an entire redesign of the structure of the plane to place it in the Spad machine by reason of a change in center of thrust by installing the Liberty motor as compared with the Hispano, and the entire aerodynamic lines of the machine would have to be changed, calling possibly for a change in stagger and a change in the landing gear location, and such changes in the machine as is generally necessitated when the aerodynamic lines are altered.

The CHAIRMAN. Can you state the difference in the weight of the two engines?

Mr. MUELLER. No.

The CHAIRMAN. Which is heavier?

Mr. MUELLER. I should say the Liberty motor.

The CHAIRMAN. Did Col. Clark then say anything about abandoning the Liberty motor?

Mr. MUELLER. Yes, it was abandoned on that date; not abandoning the motor but its adaptability to that type of plane.

The CHAIRMAN. You made no attempt at Spad construction at all, did you, beyond the securing of materials?

Mr. MUELLER. We had started more or less work in the shops in the way of jigs and fixtures.

The CHAIRMAN. Did that work turn out to be a loss?

Mr. MUELLER. Yes. In my opinion it was a loss.

The CHAIRMAN. About how much, in your judgment, was expended in that work which was afterwards abandoned?

Mr. MUELLER. I am not in a position to venture an opinion on it.

The CHAIRMAN. How many men did you have in the engineering department?

Mr. MUELLER. Thirty-five to 40 on that particular class of work.

The CHAIRMAN. How many engaged in the making of jigs, dies, and other materials?

Mr. MUELLER. I can not say, because that is in the production department.

The CHAIRMAN. You stated a few moments ago that Mr. Curtiss attended this first conference with Col. Clark?

Mr. MUELLER. Yes.

The CHAIRMAN. Is that Glenn Curtiss, for whom the company is named?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Was he then interested in the company?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Is he now?

Mr. MUELLER. Yes.

The CHAIRMAN. Was he then more actively concerned in the company than now?

Mr. MUELLER. I would say in the Curtiss Aeroplane & Motor Corporation. He was right here all the time.

The CHAIRMAN. The company?

Mr. MUELLER. Yes. He was counseled with because he has vast experience in airplanes and motors, etc., and he would be the natural man to take in a consultation of that kind.

The CHAIRMAN. Suppose that a contract should be secured for the Spads now, do you think the work that your department did upon the plans could be made available?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. You still have them?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. What time elapsed between the abandonment of further work upon the Spad and the commencement of work upon the Bristol?

Mr. MUELLER. Do you mean the very beginning of the Bristol?

The CHAIRMAN. Just answer in your own way.

Mr. MUELLER. I should say we started practically in the beginning on the Bristol about November 17.

The CHAIRMAN. How long prior to that time had you received orders to go ahead with the Bristol?

Mr. MUELLER. On October 12 Mr. Morgan informed me that he was advised by Col. Deeds in Washington that we were to have an order for 1,000 Bristol fighters to apply on the contract for 3,000 pursuit machines to take the place of 1,000 Spads. The sample machine was to have been sent us during the week of October 13. We were informed at that time that Washington was redesigning the Bristol machine to take the 12-cylinder Liberty motor. On November 6 the sample of the original Bristol machine without motor, without radiators, or parts, pertaining to the power plant was received, and at the same time we also received one incomplete set of detailed drawings which had been made up by the Signal Corps representatives.

The CHAIRMAN. In what fundamental respects was the design changed?

Mr. MUELLER. The design of the wings was changed as far as the wing curve is concerned. The location of the wings with relation to the fuselage; the motor supports, the gun arrangement. In fact, the whole power plant arrangement.

The CHAIRMAN. What gun did the British use on the Bristol?

Mr. MUELLER. My impression is they were Vickers.

The CHAIRMAN. What gun was designed by the Washington authorities for it?

Mr. MUELLER. One Marlin forward and one Vickers in the rear cockpit.

The CHAIRMAN. Were these changes the subject of discussion between you and the British representatives here?

Mr. MUELLER. No, sir.

The CHAIRMAN. You did not go into that?

Mr. MUELLER. No, sir. Various statements were made to me regarding this apparatus by British representatives who were at our plant.

The CHAIRMAN. Was the account which they gave of a satisfactory nature?

Mr. MUELLER. Yes.

The CHAIRMAN. With what engine?

Mr. MUELLER. With the Rolls-Royce engine.

The CHAIRMAN. Just proceed with your statement.

Mr. MUELLER. On November 13 we received two more duplicate incomplete sets of the redesigned Bristol prints.

The CHAIRMAN. You say, "redesigned"?

Mr. MUELLER. Yes.

The CHAIRMAN. Did the Washington people redesign the British Bristol type of plane?

Mr. MUELLER. Yes.

The CHAIRMAN. Very materially?

Mr. MUELLER. Yes. They were handling the redesign of the Bristol.

The CHAIRMAN. Let me digress for a moment. Is the Bristol a foreign type of plane?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Of what nation?

Mr. MUELLER. England.

The CHAIRMAN. Had you come into contact with it in a practical way prior to the receipt of this type of machine?

Mr. MUELLER. No, sir: I think that the sample machine we received was the first of this kind that was sent over in this country, and if I recollect, it was sent over on the recommendation of Col. Clark.

The CHAIRMAN. What engine did the British use in the Bristol?

Mr. MUELLER. The Rolls-Royce.

The CHAIRMAN. Did you have any information in regard to the record of the performance of that machine?

Mr. MUELLER. No, sir.

The CHAIRMAN. Have you had any since?

Mr. MUELLER. These two sets of prints that came in on November 13 were still incomplete. On November 14 I was in Dayton and took up with Col. Clark the question, not only of detail drawings, but layouts showing the complete machine, position of motor, where the wings were to be located on the fuselage, and such information as would give us some idea of just how the machine would be put together. We have never received up to this time any detailed drawings, and did not have a general conception of just what the machine was going to look like. Col. Clark advised at that time that these layouts and general information pertaining to the general arrangement of the machine would be shipped to us not later than Friday, November 16.

The CHAIRMAN. Shipped from Dayton?

Mr. MUELLER. Yes, sir. In the meantime Col. Clark, or rather the Signal Corps engineering department had moved from Washington to Dayton. We found that the drawings received from the Signal Corps could not be turned over to our manufacturing departments for production, and from the outset it was necessary for us to retrace and remodel a great many of the Signal Corps drawings to put them into shape so our men could read them according to our manufacturing methods.

The CHAIRMAN. Why?

Mr. MUELLER. For instance, every manufacturing concern has its own way of labeling drawings.

The CHAIRMAN. Not because they were incomplete in themselves?

Mr. MUELLER. No. During the time we were receiving the detailed drawings we endeavored to make assembly drawings ourselves, so as to prove that the detailed dimensions would check and the parts would go together. In other words, we would receive a drawing here and there but would have to make assembly drawings to see if they would go together.

The CHAIRMAN. What did you find as the result of the assembly of drawings?

Mr. MUELLER. We found a great many errors, where the bolt holes were not in line. The angles at which the plates should be set were not correct to take the correct wire pulls. In fact, as we were finding them on the drawing boards the shops had in the meantime attempted to build certain parts from a certain set of these Signal Corps drawings which we had sent out to them, so we had a double check on the drafting board as well as on the model piece. We had asked on various occasions for the aerodynamic data on the machine, as well as the stress analysis of the machine, to find out whether or not it was balanced and whether or not the parts of the machine were strong enough for the loads which come on those parts.

The CHAIRMAN. Did you get those?

Mr. MUELLER. I made a specific request on December 14 at a conference held in Dayton with Col. Clark and Mr. Perrin, representing the Signal Corps, at which Mr. Hoffman, of my staff, was present. Col. Clark advised that he would send us the stress analysis and aerodynamic data when he could get it in shape for formal transmission, but at that time stated verbally that the highest speed of the Bristol was calculated as 142 miles an hour, and its slow speed at 56 miles an hour, with an estimated weight of 2,900 pounds. At that conference we took up with Col. Clark the question of altering the designs to accommodate our production, to accommodate our clips, our fittings, our wire pulls, and such like without interfering with the weight of the machine and the strength of the machine, and he granted permission at that time to do that, providing that did not upset the flying quality of the machine. However, he laid considerable stress on the fact that we should adhere by all means, if possible, to the drawings which had been sent to us by the Signal Corps, in that their designs were supposed to be a copy of the British designs, the British machine having been flown successfully for a year or so over there, and that we were taking chances to change the design submitted to us by the Signal Corps. When we brought up the question of design, a part not

being designed right as we saw it, the answer generally was—not so much on the part of Col. Clark or on the part of Mr. Perrin—would be, “Well, there is a machine they have flown in England. Why should it not work here?”

The CHAIRMAN. The intention at that time, however, being to use an entirely different type of engine?

Mr. MUELLER. Yes; it was a different machine entirely.

The CHAIRMAN. Did you express that fact to Col. Clark?

Mr. MUELLER. We did not have the general drawings and outlines to appreciate the big difference between the Bristol being designed by the Signal Corps and the original Bristol machine.

The CHAIRMAN. So that you could not go into that subject?

Mr. MUELLER. We could not. I should venture this remark; that when we first saw the English machine we were very much disappointed and had the feeling that she would hardly have the performance which had been claimed for her.

The CHAIRMAN. How long after that was it that you saw the English Bristol machine?

Mr. MUELLER. The English Bristol sample machine was at our plant.

The CHAIRMAN. Perhaps I misunderstood you. My understanding was that it was only when you saw the Bristol machine equipped with the Rolls-Royce engine and ready to use that you appreciated the difference between that machine and the so-called Bristol plans which had been furnished you.

Mr. MUELLER. I have never seen a Bristol machine equipped with the Rolls-Royce motor, but I have seen sufficient of the Bristol machine equipped without a motor to give us an idea of those lines.

The CHAIRMAN. Did they differ substantially from the lines in the plane plans of the Aviation Construction Board?

Mr. MUELLER. No; only in detail in the machine generally, with the exception of the power plant in the forward end of the machine.

The CHAIRMAN. At what time were you instructed or permitted to go ahead with the actual production of Bristol planes?

Mr. MUELLER. When we first received the Signal Corps prints it was understood that we should start immediately on the production of, I think it was, one or two sample machines. We released to the shops, in order to get the sample machines started, copies of the Signal Corps drawings as they were sent to us, and the shops took it upon themselves to interpret the Signal Corps drawings into our own methods of manufacture and design while we were actually putting into black and white the transferring of the Signal Corps drawings onto our regular production tracing sheets.

The CHAIRMAN. When did you begin the work of actual construction?

Mr. MUELLER. I should say it was in the latter part of November or the early part of December that we sent our first Signal Corps drawings out to the shops to start work on the first sample machines.

The CHAIRMAN. How long after that did you begin the work of construction upon the machines for actual use?

Mr. MUELLER. I should say around the 1st of January.

The CHAIRMAN. Now, between the commencement of work upon your sample machine and the 1st of January, were many changes made or suggested by our Government engineering board at Dayton?

Mr. MUELLER. No. We were forced to make changes in their designs because the parts would not go together.

The CHAIRMAN. Can you give me an approximation of the number of changes which that circumstance required?

Mr. MUELLER. In detail as to very minor detailed dimensions I should say they ran into several hundred.

The CHAIRMAN. When was the first machine completed and ready for flying tests?

Mr. MUELLER. March 5.

The CHAIRMAN. You flew a machine here?

Mr. MUELLER. Yes.

The CHAIRMAN. You flew a machine here which shortly after landing was destroyed?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Was that the first machine?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Who was the aviator who flew that machine?

Mr. MUELLER. Maj. Smith flew the machine for the first time.

The CHAIRMAN. What was the cause of its destruction?

Mr. MUELLER. Fire. The machine at that time was in the control of the Signal Corps for testing. The motor engineers of the Signal Corps were investigating troubles we had been experiencing with the oiling system of the motor. That is, the motor was run in the machine at the field with the exhaust manifolds of the motor off. It is the general concensus of opinion and mine that the blast from the propeller forcing the heated gases and heated sparks down through the cowlings surrounding the motor is what started the fire. The fire was put out rather promptly without a great deal of injury to the machine and Col. Hall and I went out within an hour or so after the fire had been put out to make an investigation, and while there the motor was started up again by the Signal Corps representatives and apparently through a short circuit or spark somewhere the machine took fire a second time and was entirely burned.

The CHAIRMAN. Your information, then, is that that was due to defects in the Liberty motor?

Mr. MUELLER. No, sir; my opinion is that it was due to a little carelessness in running the motor with the exhaust manifolds off the motor.

The CHAIRMAN. That is, an important feature or part of the motor was left off, and if that had been used the accident would probably never have occurred?

Mr. MUELLER. No, sir. Our boys had cautioned the men not to run the motor that way because we had had considerable experience that way in running motors without manifolds on account of the hot gases blowing down around the carburetors.

The CHAIRMAN. Did you suggest to the Government aviator the importance of that fact?

Mr. MUELLER. I did not, but I was given to understand that one of our flyers did.

The CHAIRMAN. At any rate the running of the machine without these exhaust manifolds was not the fault of the Curtiss Co.?

Mr. MUELLER. No, sir.

The CHAIRMAN. You spoke of difficulties with the oiling system. Will you describe what they were?

Mr. MUELLER. I did not know until some time afterward that we were experimenting or flying with Liberty motors of the original design, using what is known as a scupper oil feed system. The result was that the motor was passing entirely too much oil into the chambers which cause a decided fouling of the plugs, particularly when combustion was shut off and the machine was permitted to glide in the air with the propeller turning over with air resistance on the propeller which maintained practically the same amount of oil flow throughout the cylinders without the combustion of that oil. We had spark plug trouble in that the spark plugs themselves appeared not to be adequate for the extreme conditions.

The CHAIRMAN. What other system of oiling is there?

Mr. MUELLER. A pumping pressure system.

The CHAIRMAN. Has this been substituted for the scupper system?

Mr. MUELLER. Yes, sir. Since we have used motors with the new oiling system we have not experienced the same trouble.

The CHAIRMAN. Was the scupper system used with any of the other types of engines with which you are familiar?

Mr. MUELLER. No, sir; I do not think they are generally. The Liberty motor was at first unique. Scupper feeds are a new idea in aviation motors but not in automobiles.

The CHAIRMAN. They are used upon automobile engines rather than on aviation engines?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Would the position of this machine in the air have anything to do with the efficiency of the scupper system?

Mr. MUELLER. Not a great deal.

The CHAIRMAN. When did you begin efforts at quantity production of the Bristol machine?

Mr. MUELLER. I would like to leave that question open and give you an exact idea of it later on.

The CHAIRMAN. During the month of March how many changes were required or made in the construction of the Bristol plane?

Mr. MUELLER. Changes were being made constantly. I should say they ran all the way from a thousand to twelve hundred changes.

The CHAIRMAN. Were they made by the aviation department or by the Curtiss Co.

Mr. MUELLER. I would say that the changes originated generally in the aviation department and were forced to be made by the Curtiss Co. because the parts would not go together generally.

The CHAIRMAN. Were they necessary changes?

Mr. MUELLER. I can only speak from our side; yes.

The CHAIRMAN. Were they made necessary because of the imperfect character of the plans furnished by the Department?

Mr. MUELLER. Yes, sir. Incomplete and imperfect, I would say.

The CHAIRMAN. They were incomplete rather than imperfect.

Mr. MUELLER. Both.

The CHAIRMAN. To what extent did the making of these changes interfere with the production or the manufacture?

Mr. MUELLER. It affected the entire program completely. I would like to make a few statements here. When this machine was first sent

to us for production we knew that only a machine gun fore and one aft were to be used. We had no intimation whatever from the Signal Corps that other apparatus was to be installed in the machines, and after we had gotten our first sample machine out with all these supports and these cartridge tanks, cartridge chutes, etc., for one gun forward, orders came to us from the Signal Corps to change the design to accommodate two guns forward.

The CHAIRMAN. Still using the Marlin gun?

Mr. MUELLER. Still using the Marlin guns, yes, sir. We immediately, with the assistance of the representatives of the Signal Corps, who were sent here redesigned the supports in the forward part of the machine to accommodate the two guns. After that had been just about completed instructions were received from day to day to add more equipment such as bombing gear, photographic apparatus, wireless apparatus, signaling apparatus, oxygen tanks, and one or two other minor details.

The CHAIRMAN. Heating?

Mr. MUELLER. Yes. As each new class of material was added different executives who handled that class of work for the Signal Corps would come here and instruct us as to how it should be installed. It was very apparent to me that each division was trying to get its apparatus in irrespective of the effect it would have on the flying qualities of the machine, and without any regard to the performance of the machine whatever, as to strength, flying qualities, or how the machine would be generally affected by adding more weight and in affecting the structure by fastening various classes of apparatus on it at different points. The problem got so serious that through conversations which I had with the local representatives of the Signal Corps at that time, it appeared necessary that some one come here to take a hand and actually give us a decision as to what should or should not go in, and where the various divisions should start and stop their work as it applied to the machines.

Col. Hall, representing the Engineering Division of the Signal Corps, arrived here, and I laid the whole situation out to him, and it was then that we took a machine off the floor and put it in our job shop with a view of making a model machine which would contain all the apparatus described previously in it.

The CHAIRMAN. That was about when?

Mr. MUELLER. I should say around the 15th of April, or something like that. Col. Hall, as we understood it, had been through practically the same condition at Dayton with the De Haviland 4's and was in position to give us definite information as to what the apparatus of different kinds consisted of and how it should be applied or fastened to the machine, and a sample machine was built along that line. They started production on the first 25 as per the sample built in the job shop.

The CHAIRMAN. Did these machines contain all the different apparatus you have mentioned?

Mr. MUELLER. The first 25 machines which we were to build were to be so constructed as to receive all the apparatus previously mentioned. We built several machines and the first lot of about 12 out of the 25 were shipped to Dayton for test flights. Upon arriving at Dayton a number of changes appeared necessary from the fliers'

standpoint in that the operating of the machine was not convenient for the flier, and certain parts also were not as strong as they might have been or were desired to be.

The CHAIRMAN. How recently has that situation been developed?

Mr. MUELLER. Within the last month.

The CHAIRMAN. So that those machines which you finished and sent to Dayton may be said to be still in an experimental stage?

Mr. MUELLER. Yes, sir. I want to add further, that Dayton, according to Col. Hall, is correcting the machines so as to make good and satisfactory flying machines out of them.

The CHAIRMAN. Do you understand that machines are used on the front designed for the actual carrying out of all these various purposes in the same machine?

Mr. MUELLER. I never heard of it before.

The CHAIRMAN. This is, then, a departure from accepted practice on the front as far as you know?

Mr. MUELLER. Yes. Since then I have been instructed to remove some of the apparatus.

The CHAIRMAN. What?

Mr. MUELLER. The bomb gear and the photographic apparatus are two sets of apparatus which have been removed.

The CHAIRMAN. That also required the readjustment of plans?

Mr. MUELLER. Only to a very small extent.

The CHAIRMAN. To some degree?

Mr. MUELLER. Yes.

The CHAIRMAN. Coming back to the Liberty engine. We noticed yesterday that the radiation system provided for the Liberty engine in the Bristol plane consisted of radiators at right angles to the fuselage and extending outward two feet or so. Isn't that an unusual type of construction?

Mr. MUELLER. Yes, sir; that is unusual.

The CHAIRMAN. Why was it necessary to do that?

Mr. MUELLER. The Signal Corps Engineering Department, early in the design of the Bristol machine, were averse to using nose radiators on any of their machines, and it was also their desire to get as fine a streamline effect and entering wedge effect on the Bristol as possible, believing it would help in the speed of the machine. The Liberty motor does not lend itself well to streamlining in the front because of the size of the radiator necessary for proper cooling. Also, radiators at the nose of the machine are considered not as efficient from a cooling standpoint as they would be right out in the wings of the machine itself. About the only place they had to locate a radiator, therefore, was alongside of the fuselage, close in, so as not to obstruct the vision from the pilot's cockpit. They might also have considered a radiator along the top of the wing, but I am not in a position to say why that was not entered into in the designs.

The CHAIRMAN. Is it not a fact that it was discovered, before these radiators were adapted to the machine, that the radiation surface of the Liberty motor as before then constructed was insufficient for proper cooling?

Mr. MUELLER. Yes, sir; I personally showed the Signal Corps engineers where the size of the radiators they had specified, which, by the way, are only half as large as the radiators being used, were inadequate for the cooling of the Liberty motor.

The CHAIRMAN. When did you do that, about?

Mr. MUELLER. Some time in February.

The CHAIRMAN. At that time you notified them that their radiation was insufficient. Could the surface as it then existed have been extended so as to make it sufficiently large? Perhaps you have done that in this instance. Where was the radiation at that time in the machine?

Mr. MUELLER. Right where it is at present.

The CHAIRMAN. So that this radiation as now appearing in the machine is an expansion or extension of the system of radiation at the point where it existed at that time?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. What effect does that extension have upon the speed of the machine?

Mr. MUELLER. I should say about 5 miles an hour. I have secured readings here with the radiators off, using the wing radiator, and developed $3\frac{1}{2}$ to 4 miles an hour greater speed.

The CHAIRMAN. The wing radiation would not interfere so materially with the speed as the present system?

Mr. MUELLER. No, sir.

The CHAIRMAN. Would there be any difference in the expense?

Mr. MUELLER. No, sir.

The CHAIRMAN. Do you know of any other engines which resort to wing radiations?

Mr. MUELLER. Yes, sir. The German Albatross has a horizontal radiator in the wing, and there have been two or three planes built in this country using a radiator located in the top panel, with the circulation vertical to the panel. We have ourselves put out a few machines with radiators extending out like ears.

The CHAIRMAN. Which would be your preference?

Mr. MUELLER. The leading edge of the wings or a horizontal radiator placed right in the wing itself on the plan used in the present Albatross.

The CHAIRMAN. You think that would interfere less with the speed of the machine?

Mr. MUELLER. It has been proven so.

The CHAIRMAN. To what extent does this extended radiator increase the size of the engine?

Mr. MUELLER. None. The radiation is designed to accommodate the motor, not the motor to accommodate radiation, as far as the radiators themselves are concerned.

The CHAIRMAN. Well, as compared with the engine at the time you called attention to the insufficient radiation?

Mr. MUELLER. I just developed the size of the radiator as originally designed to accommodate the motor.

The CHAIRMAN. Do you know of any other machine which has these extended radiators at right angles with the fuselages?

Mr. MUELLER. No; not in that position.

The CHAIRMAN. I think Col. Hall said something about the Rolls-Royce or Renault so operating.

Senator NEW. Col. Hall said yesterday that the French Renault has its radiation placed just as it is on the Bristol.

Mr. MUELLER. As I remember, the radiation has its biggest dimension in the length of the fuselage.

The CHAIRMAN. It is parallel instead of at right angles to the fuselage?

Mr. MUELLER. Yes.

The CHAIRMAN. Now, Mr. Mueller, have you at any time had occasion to discuss the adaptability of the Liberty motor to the Bristol planes with representatives of the Government?

Mr. MUELLER. No; I was never consulted regarding that at all.

The CHAIRMAN. That brings us up to the question which I asked yesterday evening when we adjourned. I wish you would give us your opinion as to whether or not the combination of the Liberty motor with the Bristol plane will prove practically successful?

Mr. MUELLER. I would answer that in this way: That you are not giving the Liberty motor a fair chance in that plane.

The CHAIRMAN. Why?

Mr. MUELLER. I don't think that the plane itself is properly designed. The construction of the plane is such as to cause a great choking of the air immediately above the fuselage and immediately below the fuselage. It is a machine which I do not think a man versed in aerodynamics would select as a thoroughly well-designed flying machine.

The CHAIRMAN. Isn't it necessary in order to secure the best results from the Liberty motor that a plane be constructed with reference to the shape and size and performance in experimentation of that engine?

Mr. MUELLER. Absolutely. The machine should be designed to the motor, not the motor to the machine.

The CHAIRMAN. Isn't that true in regard to all engines and all machines?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Do you consider the Bristol machine as used by the British, who designed it in connection with the Rolls-Royce engine, a practical and successful type of machine?

Mr. MUELLER. It may have proven so and no doubt has proven, if the reports submitted to me are authentic, a very successful and practical machine, but from a designer's standpoint, and comparing it with other machines which have performed very successfully, such as the Nieuport, the Albatross, the De Haviland, and such like, I should say that it was not a well-designed machine.

The CHAIRMAN. Which is to say that it is not such a type of plane as you would have recommended to the Government in connection with the Liberty or any other engine?

Mr. MUELLER. Absolutely no. Not only from the standpoint of aerodynamics but from the standpoint of the construction and the assured safety of the machine.

The CHAIRMAN. That is your judgment after this experience which you have had with the machine?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Both as to its plan and its production.

Mr. MUELLER. Yes, sir; as a matter of fact I think our engineers who saw the machine when the sample was first sent here felt that at the outset.

The CHAIRMAN. Did you take occasion to express what you felt to the Government engineers or any of them?

Mr. MUELLER. I did not.

The CHAIRMAN. Why?

Mr. MUELLER. The Curtiss Co. at that time were in a position where they thought it was best not to make any statements which would reflect on the Signal Corps. We were to take and build what they gave us.

The CHAIRMAN. And be glad to get it?

Mr. MUELLER. Be glad to get it.

The CHAIRMAN. And you have gone ahead upon that attitude since that time?

Mr. MUELLER. Yes, sir.

Mr. MORGAN. The reason that attitude was taken by all of us in the organization at that time was due to the fact that a great many rumors had reached Washington to the effect that representatives of the Curtiss Co. here had knocked the Liberty motor, and we were very careful not to make any remarks of that kind.

The CHAIRMAN. I suppose also your experiences with the Spad might have had something to do with it?

Mr. MUELLER. Yes, sir. After we designed the Spad or copied the Spad, which is a very finely-designed flying machine, and having to pick up the Bristol and rebuild a very great part of it.

The CHAIRMAN. Have the engineers in the Curtiss Co. at any time been requested or invited by the Government representatives to make suggestions of your own?

Mr. MUELLER. Only since Col. Hall has been here in charge of production.

The CHAIRMAN. And that has been very recently?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Since then you have been encouraged to make suggestions of your own?

Mr. MUELLER. Yes, sir. It has been a very mutually cooperative arrangement.

The CHAIRMAN. And that has been productive of benefit?

Mr. MUELLER. I think so.

The CHAIRMAN. During this period the Curtiss Co. has been designing an engine of its own, has it not?

Mr. MUELLER. Yes.

The CHAIRMAN. To what extent has that design been perfected?

Mr. MUELLER. The motor has been tested for weeks on the block, off and on, and I understand we have obtained readings from it ranging all the way from 420 to 435 and 438 horsepower.

The CHAIRMAN. You have not tried it out to see what speed it would develop?

Mr. MUELLER. No, sir. It has not yet been applied to a plane. The motor was designed for an aeroplane.

The CHAIRMAN. Has the company done anything in the direction of designing an airplane?

Mr. MUELLER. Yes, sir. The Curtiss Aeroplane and Motor Corporation have not, but the Curtiss Engineering Corporation have.

The CHAIRMAN. That is the company which was created for the purpose of cooperating with the Aeroplane Co. in the production of engines and airplanes?

Mr. MUELLER. Yes, sir. I might add that the design was started by the Curtiss Aeroplane and Motor Corporation and is being finished up by the Curtiss Engineering Corporation.

The CHAIRMAN. Is this engine with which you have been experimenting designed for the heavy type of fighting machine, with a bombing plane or a lighter type?

Mr. MUELLER. It is designed for the lighter, fast-speed type, but if it is applicable to the fast-speed type it surely is to the other type.

The CHAIRMAN. That is to say, if it can do the fast work it should do the slow work as well?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. Is it a geared machine?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. And the Liberty is not?

Mr. MUELLER. It is not a geared machine.

The CHAIRMAN. Is it not probable, Mr. Mueller, that in the event the Bristol plane is produced in quantity, as will probably be the case very soon, that it will be found to be impracticable for the purpose for which you are constructing it? In other words, is it not possible that we may be up against a further disappointment after quantity production begins?

Mr. MUELLER. I do not know as I am in a position to answer that, because I personally have not secured information regarding the performances of the machine on the other side. I mean the performances of the British machines on the other side. I have reports of performances of machines on the other side ranging from 125 to 140 miles. Those same machines do not seem able to perform over here when you put them to our tests. If a machine traveling 120 miles an hour with a full military load can be considered a very efficient machine on the other side to-day, then the Bristol will very closely approximate that speed before we get through with our entire production of it.

The CHAIRMAN. Do you know whether the British are using the Liberty motor in their Bristol plane?

Mr. MUELLER. They are not.

The CHAIRMAN. What type of plane do they use the Liberty motor in?

Mr. MUELLER. As far as I know, they are not using the Liberty motor at the present time.

The CHAIRMAN. They are experimenting with some types of plane. Do you know what types they are?

Mr. MUELLER. No, sir.

Mr. MANLY. I know that the British placed an order for several thousand Liberty motors while we were over in England in March, and that the expectation was to use those in the seaplanes, the large seaplanes, or flying boats, such as the H-16, which we are supplying over there, and the large machines such as the Handley-Paige bombing machines.

The CHAIRMAN. To what extent the experiments have gone, you do not know?

Mr. MANLY. I am not advised, because at the time I left there the first Liberty motor which had been promised from time to time had not arrived.

Senator FRELINGHUYSEN. You have a laboratory and test the tensile strength of wires and the various equipment on an airplane, do you not?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. You test before production practically all of the parts used in an airplane?

Mr. MUELLER. That is, the materials, we do.

Senator FRELINGHUYSEN. Have you tested the parts used in the Bristol fighter as redesigned by the Signal Corps?

Mr. MUELLER. That question is rather hard to answer. I will endeavor to give you some information on that subject in this way: we test the wires to see that they come up to a certain strength per square inch, and the same with the plates, and also run the sand load test on the wings to see that the wing as a whole will stand certain loading, and we have actually tested out the machines in actual flights, and I will state that the Curtiss Co. in running a stress analysis on the Bristol machine found a number of parts which were undersized, and, upon approval by the Signal Corps, we increased the size of the parts to take care of the factor of safety required by the Signal Corps.

Senator FRELINGHUYSEN. In other words, you included in your test the original parts of the sample that you had which the Signal Corps sent for you to copy?

Mr. MUELLER. We tested certain parts, yes. We have to do that right along.

Senator FRELINGHUYSEN. Where is the engineering department of the Signal Corps located at the present time?

Mr. MUELLER. I am not sure whether in Dayton or Washington. At the time of our negotiations it was located in Dayton. It started in Washington and went to Dayton. I think it is divided now between Washington and Dayton.

Senator FRELINGHUYSEN. Then there are two engineering departments of the Signal Corps?

Mr. MUELLER. Yes. I also know that there are two divisions. One of them is experimental and one is a production engineering department.

Senator FRELINGHUYSEN. Who has the authority in the engineering department in Washington, to whom you look for orders?

Mr. MUELLER. Maj. Gray, as far as we know, is the head of the production engineering department, and Col. Hall, on letters sent to us by Mr. Kellogg, is final, in all matters of engineering production, etc., on the Bristol machine. Col. Vincent, as far as I know, and it is my understanding at the present time, has charge of all the experimental work in the airplane engineering department of the Signal Corps.

Senator FRELINGHUYSEN. Have these men ever had any experience, or have they been connected with any corporation manufacturing aeroplanes?

Mr. MUELLER. I should say that Col. Hall had had more to do with designing of aeroplanes and aeroplane motors than any of them. I do not know that Maj. Gray has ever been connected with an aeroplane factory, or that Col. Vincent has. He has, of course, been connected with the Packard Motor Co., whom I understand have for some time been working upon an aviation motor.

Senator FREYLINGHUYSEN. His experience has been confined to the building of engines?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. And not the designing and manufacturing of aeroplanes?

Mr. MUELLER. Yes, sir; as far as I know.

Senator FRELINGHUYSEN. Have any of them been connected with a company manufacturing aeroplanes?

Mr. MUELLER. I think not.

Senator FRELINGHUYSEN. Has that science been developed, the science of aerodynamics, in connection with planes to any extent in this country?

Mr. MUELLER. Its greatest development has been during this last year. Prior to that time practically nothing excepting what was under the control and in the hands, you might say, of aeroplane manufacturers, such as the Wright Brothers, Standard Aircraft Corporation, and the Curtiss Company and one or two smaller concerns.

Senator FRELINGHUYSEN. What are the other smaller concerns?

Mr. MUELLER. I can not tell you.

There was the L. W. F. Engineering Corporation, the Burgess, the Aero Marine, and Sturtevant aeroplane companies, the Wittemann-Lewis Co.

Senator FRELINGHUYSEN. Now, you spoke of a closer cooperation between yourselves and the Engineering Department of the Signal Corps?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. Which has been recently brought about?

Mr. MUELLER. Yes.

Senator FRELINGHUYSEN. What has occasioned that?

Mr. MUELLER. The inability to get decisions when we could not get production through parts not going together; lack of information as to what apparatus was to be installed in the Bristol machine.

Senator FRELINGHUYSEN. Who has brought about that better understanding between you?

Mr. MUELLER. Col. Hall.

Senator FRELINGHUYSEN. Col. Hall shows a disposition to cooperate?

Mr. MUELLER. Oh, the other men showed a disposition to cooperate, but they did not have the knowledge and did not have the authority to make decisions which would permit us to go ahead with production.

Senator FRELINGHUYSEN. You have manufactured and delivered to the Signal Corps a large number of advanced and primary training planes?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. In these planes have been installed Curtiss engines?

Mr. MUELLER. Yes, a Curtiss OX and the Hispano motor.

Senator FRELINGHUYSEN. In the manufacture and delivery of the Curtiss engine were any suggestions made, or was there any interference by the Signal Corps with your specifications and designs?

Mr. MUELLER. I should say, "Yes," as more machines got into the field and were put to use a great many changes were required in the way of strengthening some of them. I think some of them were

not altogether necessary, because I think some of the aviators do not realize fully that they are not driving an ice wagon but are flying a flying machine. Then we were also requested to install more instruments of all kinds, and the instruments or the information pertaining thereto was not available.

Senator FRELINGHUYSEN. This has all brought about more efficiency in the engines?

Mr. MUELLER. This did not pertain to the motors themselves, but to the production of the complete plane. The motor is just one division of it.

Senator FRELINGHUYSEN. They have not, then, interfered in any way with the type of motor?

Mr. MUELLER. I do not think so. On the OX5 construction there are one or two minor changes, but I would not say that the design of our motor has changed very materially from the date we first put them out.

Senator FRELINGHUYSEN. Then, the situation is this, with regard to the motor; in the primary and advance training planes you have produced a satisfactory motor?

Mr. MUELLER. We are not producing the motor for the advanced training machine. That is a Hispano-Suiza motor.

Senator FRELINGHUYSEN. Well, for the primary machines?

Mr. MUELLER. Yes; also the Willys-Overland, the OX5 motor.

Senator FRELINGHUYSEN. Do you keep a record of the casualties?

Mr. MUELLER. No, sir.

Senator FRELINGHUYSEN. Could not the Hispano-Suiza have been developed in this country for the Bristol and used more successfully in that plane?

Mr. MUELLER. Anything could be developed in this country. I see no reason why the Hispano-Suiza motor could not have been developed in this country successfully.

Senator FRELINGHUYSEN. Would it have been a better motor for the Bristol fighter?

Mr. MUELLER. My impression is, yes.

Senator FRELINGHUYSEN. To get back to the Liberty motor; is the ignition system that is now used the best that can be used on it?

Mr. MUELLER. I think it is very satisfactory and I do not know how it could be improved upon.

Senator FRELINGHUYSEN. I understand the cylinders are placed at an angle of 45° while other cylinders are about perpendicular.

Mr. MUELLER. That all depends upon the designers. Some favor a greater angle between the cylinders when you have a V motor, and designs vary.

Senator FRELINGHUYSEN. What do you prefer?

Mr. MUELLER. As a matter of fact I am not in a position to state a preference, because I am not considered and do not consider myself a motor expert. All I am looking for is results. When it comes to designing a motor I would not tackle the job.

Senator FRELINGHUYSEN. I am going to ask you a leading question. Do you believe the Bristol fighter as now designed will be an effective fighting machine for our Army at the front?

Mr. MUELLER. I should not rate the Bristol machine as a first-class fighting machine that would hold its place among the first and highest speed fighting machines over there. It has an applica-

tion in conjunction with other machines which we are building in this country to-day and I think that the use of the machine will be very valuable if used for specific purposes; as a secondary fighting machine, not as a primary, and aggressive fighting machine. Its greatest application, I believe, will be reconnaissance.

Senator FRELINGHUYSEN. There are a great many corrections that will have to be made in it before it can be successfully used, are there not?

Mr. MUELLER. No; I would not say that a great many corrections would have to be made. You are talking about the machine to-day, as it exists on our floor?

Senator FRELINGHUYSEN. Yes.

Mr. MUELLER. I would say no. I think within one week we will have concluded all the changes that will be necessary in the Bristol machine to make it a good, safe, sane, slow fighting machine. I doubt if the Bristol machine can ever be made a fast fighting machine.

Senator FRELINGHUYSEN. Have you any statement to make or any suggestions to make to the committee looking to an improvement in the designing or a mention of any machines that will more properly equip the Army.

Mr. MUELLER. No. But I would like to make this recommendation: That when the Signal Corps or Aircraft Production Board contemplates the building of more planes that they seek the counsel of the engineering departments of the manufacturers who have been building planes during the war and prior to the war; that the new planes be not considered merely on their performance in the air, but also from a production standpoint. My sincere recommendation is that they seek the counsel of men who have had experience not merely with designing or flying but also with the question of production facilities of the big manufacturers in producing those planes.

Senator FRELINGHUYSEN. You have on the floor a type of plane called the SE-5.

Mr. MUELLER. Yes.

Senator FRELINGHUYSEN. The Government contemplates ordering some of those machines?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. Were any of the manufacturers consulted as to the desirability of that type of machine?

Mr. MUELLER. I am not in a position to answer, but as far as the Curtiss Co. is concerned, "No," excepting up to a point that they wanted us to build some of these machines.

Senator FRELINGHUYSEN. Well, a thousand is a considerable number, is it not?

Mr. MUELLER. We did not know until we were called to Washington that the Government had decided apparently to build some SE-5 machines, to produce some SE-5 machines in this country. We were asked to make an inspection of the machine and state whether or not we could build it, or cared to build it. Our answer, naturally, is "Do we need the business or not, from a business standpoint? We are in a position to get the planes out, no matter what they are, and the SE-5 may as well be built as anything else."

Senator FRELINGHUYSEN. What sort of machine is the SE-5?

Mr. MUELLER. A single-seater fighting machine.

Senator FRELINGHUYSEN. Who determines the policy or the aircraft war strategy?

Mr. MUELLER. I do not know.

The CHAIRMAN. Has the Curtiss Co. an order for what is called the SE-5 type of machine?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. That order embraces how many machines?

Mr. MUELLER. 1,000.

The CHAIRMAN. What is the SE-5 model?

Mr. MUELLER. It is a single-seated, two-gun, biplane machine, to be equipped with what is known as 180 horsepower Hispano-Suiza motors.

The CHAIRMAN. Is the SE-5 a British or French model?

Mr. MUELLER. It is a British model.

The CHAIRMAN. Have you the plans and specifications for the construction of this machine?

Mr. MUELLER. We have a set of English drawings of this machine and also have a sample machine at our plant, but the plans and the machine pertaining to the SE-5 that we have are for a 220 Hispano motor.

The CHAIRMAN. Will these require later a change in construction on other plans preliminary to construction?

Mr. MUELLER. But very few.

The CHAIRMAN. How soon can you begin the manufacture of the SE-5 upon the plans which you now have with the changes which you may have to make?

Mr. MUELLER. My estimate would be not under three months, and more nearly four months.

The CHAIRMAN. Is the engine to be installed in these SE-5 machines an engine which can also be installed in the Spad?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. How soon can you begin the manufacture of the Spad machine in place of the S-E 5 if the order were for that machine instead of the S-E 5?

Mr. MUELLER. I should say at least 30 days and possibly 60 days sooner.

The CHAIRMAN. In other words, you think you could save from 30 to 60 days in the matter of construction?

Mr. MUELLER. Yes, sir.

The CHAIRMAN. And at the same time turn out as good a machine?

Mr. MUELLER. Yes, sir.

Senator FRELINGHUYSEN. Then, in your opinion, it would be more desirable, certainly from the element of time, to take up the construction of the Spad instead of the S-E 5 as far as production is concerned?

Mr. MUELLER. Yes, sir. As to relative values, as a flying machine, according to reports which I have, they are on about a par.

Senator NEW. I would like to ask if Mr. Mueller knows, or, if not, if there is any one present here that knows the exact facts, as to whether the Spad is in regular use on the other side, or whether it has been discarded.

Mr. MANLY. There are no less than six factories in France engaged in the manufacture of Spad machines; that was the fact on the 2d day of April, when I left France. The production of Spad machines was being kept up very regularly, and I talked to a number of both our own aviators and French aviators who are using them constantly in regard to the performance they got out of them. And they all praised the machine very highly, and in no case did I find any of them who had any adverse criticism against the machine as being one that was not fully equal to meeting the enemy in the air.

Senator NEW. I thought it well to have the answer to that question in this record inasmuch as it has been repeatedly said that the Spad has become an obsolete machine on the other side.

Mr. MANLY. In fact, our boys at the front, whom I visited at the aero stations, repeatedly asked the question, "why it was not possible that they could get machines of that quality to use for their work?" The only Spad machines with which any of our aero units were being equipped was in the Lafayette Squadron, which has maintained this equipment owing to the fact that we were not able to furnish them equipment to take the place of the French equipment they retained at the time they became an American flying squadron.

Senator FRELINGHUYSEN. Is there a different standard of measurements between the English system and the American system?

Mr. MUELLER. Yes; they use the metric and decimal system, and it always means a change in our drawings from one to the other.

Senator FRELINGHUYSEN. That takes time as well as expense.

Mr. MUELLER. Yes. That is true when working on French designs as well.

Senator FRELINGHUYSEN. Will you produce for the information of the committee and its perusal the stock list and voting trust agreement? We will not make it a part of the record. We will simply look at it. Yesterday you were looking up some information regarding the cancellation of the spare parts on the contract for the Bristol fighters. Have you procured those figures?

Mr. GUY. Yes. I have a letter here from our sales order department, which states that there was a further amendment to the order under date of May 15 and a new boguet price was applied to the supplement of the original order quoting this boguet price. The total amount of the spare orders for the Bristol machine approximate \$3,800,000.

Senator FRELINGHUYSEN. Then, instead of depleting the contract they have increased it.

Mr. GUY. Yes, sir. The order that I have before me reads, "twelve sets," which is apparently an error, as I think it is meant to mean 1200, according to the computation of our division. We speak of a set as a number of spares to be applied to one machine.

Senator FRELINGHUYSEN. Your factory here is being utilized by the Government to a great extent for the manufacture of aeroplanes. Is the continuation of orders from the Government an important factor in your manufacturing policy in procuring raw materials? In other words, in keeping yourself in stock to fill the orders?

Mr. GUY. We should be advised from four to six months in advance of the completion of an order, in order to continue our manufacturing without a gap, and to enable our purchasing departments to

properly arrange to procure the materials that will be necessary in the production of machines. I might state, in this connection, that it is frequently understood by laymen in this connection, in manufacturing work, that if a concern has an order at about the time of completing another order, that they are pretty well fortified. That is not the case, as from four to six months before the completion of shipments on an order, certain departments are out of work, certain fabricating departments, and we must have the new orders that far in advance in order to keep the entire factory going and not to have it without work in some of its departments.

Senator FRELINGHUYSEN. Have you any difficulty in procuring mahogany?

Mr. GUY. We have had difficulty in producing British Honduras mahogany, which is the kind specified generally for propellers of fighting machines.

Senator FRELINGHUYSEN. What other mahogany is used?

Mr. GUY. We have Philippine mahogany, which is almost as good, and which has been somewhat easier to obtain, and which is being allowed as a substitute on some of our propellers. They also allow a substitute of oak on training plane propellers.

Senator FRELINGHUYSEN. Is there any difficulty in procuring sufficient spruce?

Mr. GUY. We have had difficulty in maintaining our spruce supply for our production. In other words, the Government is furnishing this spruce to us, and we have to keep after them continually to keep a sufficient amount on hand to fulfill our needs.

Senator FRELINGHUYSEN. You rely entirely upon the Government?

Mr. GUY. We have no privilege to buy only through the Government.

Senator FRELINGHUYSEN. If there was a failure in delivery, it would mean a complete breakdown in the manufacture?

Mr. GUY. It would be very serious.

Senator FRELINGHUYSEN. The Government has authorized you to manufacture a new high-powered engine?

Mr. GUY. I would not say that the Government has authorized us to do that. We have done that on our own initiative.

Senator FRELINGHUYSEN. There is an understanding that they approve of it?

Mr. GUY. As I stated yesterday, they have given the Curtiss Engineering Corporation an order for four planes with this motor installed.

Senator FRELINGHUYSEN. That reverses their position as taken by Col. Montgomery in a letter to you of October 31, 1917, and replied to by you on November 10, 1917, which I incorporated in the record.

Mr. GUY. I would say that it has the appearance of reversing that stand.

(Whereupon, a recess was taken until 2 o'clock p. m.)

AFTER RECESS.

STATEMENT OF MR. C. WEBER.

The CHAIRMAN. What position do you occupy with the Curtiss Aeroplane & Motor Corporation?

Mr. WEBER. Production manager.

The CHAIRMAN. How long have you been so employed?

Mr. WEBER. I came with the Curtiss Co., I think, on the 16th of January, 1917.

The CHAIRMAN. Does your department keep account of the volume of production?

Mr. WEBER. Yes, sir.

The CHAIRMAN. Its fluctuations and its prices?

Mr. WEBER. Yes, sir.

The CHAIRMAN. I wish you would tell the committee as briefly as you can what effect on production, and particularly on cost, has been the result of giving orders for machines to the Curtiss Co., which has been explained here, and subsequent changes and abandonments?

Mr. WEBER. The best illustration that I can possibly give of a change of that caliber was a recent one, and it was a change from 700 JN-4-D's to JN-4-H's of four different types; also changing from JN-4-H's to JN-4-H-G's and JN-4-H-B's, which were two lots of 100 each taken from an order of 600 JN-4-H planes. The JN-4-H, which is the first one I shall speak of, was originally specified as 400 JN-4-H and 100 JN-4-H-G's, the G meaning gun equipment—one front and one rear gun equipment. The B was to have bombing equipment. There were 100 of those. In talking of this matter it will be necessary to touch upon some other matters pertaining to holdups in production, and pertaining to the Curtiss Co. The Signal Corps agreed to furnish certain parts—the majority of planes, wherever armament of any kind was considered—on the 100 JN-4-H-G's, and was to furnish the synchronizing device for the guns. These should have been at hand about seven or eight weeks ago. We received 100 of them; the last part of them probably came in two weeks ago. On the bombing devices we had received up to 75 as of last Saturday. That equipment should also have been here about seven weeks ago. As a consequence of our not having that equipment on hand our production went from approximately 105 or 104 or 115 per week down to 60.

The CHAIRMAN. These are devices manufactured elsewhere and then forwarded here to be attached to the machines?

Mr. WEBER. Yes, sir. Devices that the production end of the Signal Corps agreed to furnish to the company, and also have here in sufficient time for this production. We could produce out at the Churchill Street plant at the present time, say, if we could have proceeded with the JN-4-A's, or D's, at the rate of about 125 a week. What the holdup will be on the division of four different types of the JN-4-H's I can not tell, because we have just received the notification, the letter of April 22, which is a copy of the Signal Corps letter designating the different types that it is to be divided into, and, I believe, this letter was the letter which was presented to us showing what would be furnished by the Signal Corps and what we were to furnish and also giving us the data to go ahead with our engineering information, which we were to furnish the plant showing what the changes are and what material would be necessary for these changes.

We would have completed our entire program as we had calculated, at the rate we were going, about July 20. We designated July 31, as a safeguard of ten days. We have not proceeded

the delivery on this contract. I desire to say that if we had kept the same number of men employed as on the JN-4-D we would have lost at least 30 days in the dividing up of these machines.

The CHAIRMAN. Were these contracts on what is called the cost-plus system?

Mr. WEBER. No; on the flat-price basis.

Mr. GUY. They were originally contracted for back in November, some time, as D's.

Mr. WEBER. I believe April 22 is the correct date that we received the information.

The CHAIRMAN. Does that same condition happen relatively in regard to all of these other items of production where the accessories that are promised fail to come to hand on time?

Mr. WEBER. We have had a considerable amount of trouble in reference to having the material here on time. Lately, the matter has been contemplated more from this end. In other words, there is a representative here who watches out for that material, and it looks brighter for the future. The synchronizing device, I believe will be furnished by the motor manufacturers, because it is a part of the motor. It enters more into the motor mechanism than the plane. After they catch up with the shortage that will be furnished direct by the engine manufacturers. In the last few days we have received instructions to ship the planes without the bombing device or the synchronizing device, provided they were not here.

The CHAIRMAN. Where?

Mr. WEBER. To the fields—but with every provision made for their installation, so they can be fitted on in the fields.

The CHAIRMAN. That necessitates, does it not, considerable delay at Dayton, where these devices which should have been delivered here must be supplied.

Mr. WEBER. The synchronizing device is the item first mentioned. The Wright-Martin people, where the Hispano-Suiza motors are produced, have a man, I understand, on each field, and they are installing the synchronizing end of it at our plants now.

The CHAIRMAN. That is only one device.

Mr. WEBER. Yes.

The CHAIRMAN. What you call the synchronizing device is entirely different from the bombing device?

Mr. WEBER. Yes. The bombing device hangs underneath the plane and carries a number of bombs.

The CHAIRMAN. If you are permitted now to ship your machines without these devices to the testing yards or fields, it must follow, must it not, that they must be supplied there?

Mr. WEBER. Yes.

The CHAIRMAN. And that, of course, takes time which adds to the delay in getting the machines to the front?

Mr. WEBER. These machines, as I understand it, will not go to the front. These are training planes for training aviators for bombing work. I took this item on account of its being a concrete example. They are advanced training planes, of which part will be for aerial observations and have on them wireless outfits which we have not as yet constructed. In other words, they are the latest in construction of the planes.

The CHAIRMAN. Let me call your attention to another aspect of the subject. You had a contract last year for 2,000 Spads, which was abandoned. Was that what you call a cost-plus contract?

Mr. WEBER. Yes.

The CHAIRMAN. To what extent did the delay in furnishing the proper plans and consequent changes, together with the abandonment of the contract have upon the existence of this institution, which the Government, I presume, under that contract, will make good?

Mr. WEBER. I do not know about their making good on it, or exactly what the entire expenditure was. I believe, from an actual direct labor standpoint, as far as drawings and tools, etc., and things on which we could get direct labor—I believe we could ascertain that from tabulations. As to the loss in production of the plant, I do not know whether there has been any actual tabulation made of it or not.

The CHAIRMAN. How much time between the installation of this plant and the present, giving, of course, an approximation, has been lost because of the delay in receiving orders and because of changes in the plans of production?

Mr. WEBER. I believe that those drawings were to be out in 45 days. We would have been in production to some extent in September on Spads, but not a great number.

The CHAIRMAN. During the interval was the force organized and kept together and doing nothing?

Mr. WEBER. Yes. I might say that at that time I was not very active in this plant, but was watching this plant at the time, but I do know sufficient to probably give the information. The plant was being organized for the Spad or any kind of production that there would be orders for, and it was contemplated to put in Spad machines. Later on we were asked to stop on Spad machines, and we were asked to do some of our flat-price work. We put in a considerable amount of work which was kept in here until, I believe, the first day of February, when it was practically all removed at that time. That was in order to keep people here who had come from distant parts, many of them, and we endeavored to keep them busy on this work.

The CHAIRMAN. Were you able to keep them all busy?

Mr. WEBER. No; we endeavored to do that, but were not able to do it.

The CHAIRMAN. The result, then, was that a portion of your force under these conditions were idle?

Mr. WEBER. A great number of them were idle.

The CHAIRMAN. And at the same time drawing wages?

Mr. WEBER. Yes.

The CHAIRMAN. On whom did that loss fall, upon the Government or upon the Curtiss Co. or upon both?

Mr. WEBER. The loss originally has been paid by the Curtiss Co. Whether the Government has reimbursed them or not I can not say.

Mr. GUY. Under the cost plus contract naturally this cost would reflect on the Government, and it would affect the Curtiss Co. in so far as its percentage on the boguet established contract. The boguet in the contract provides a certain amount for the cost of the machine, and anything we saved under that amount we got 10 per cent of the saving.

The CHAIRMAN. But under the arrangement, the organization unemployed which you must keep is a part of the expense which the Government under a cost plus contract must bear.

Mr. GUY. That is correct.

The CHAIRMAN. And that was the fact in the case of the Spad contract.

Mr. GUY. Yes. And then in addition to that cost to the Curtiss Co. by permitting a flat-price contract to go into its plant, with a green crew, and with an improperly organized crew; that is, a crew which had not been put here for the purpose of doing that kind of work, made the cost of those parts through spoilage and other inaccuracies very heavy to the Curtiss Co. on this flat-price contract.

The CHAIRMAN. Did it also add to the cost of the maintenance of your Churchill Street plant?

Mr. GUY. That is what I mean.

Mr. MANLEY. Was it not a matter of keeping them more effectively busy? There was so much delay that you got no efficiency out of them?

Mr. GUY. That is true.

The CHAIRMAN. Are you a native-born citizen of the United States?

Mr. WEBER. Yes, sir.

Mr. MORGAN. In order to keep the cost down the Curtiss Co. was to receive everything over 10 per cent, and they received no per cent on anything over \$6,000.

The CHAIRMAN. But the Government paid the excess.

STATEMENT OF MR. CHARLES M. MANLY.

The CHAIRMAN. What is your occupation?

Mr. MANLY. Consulting engineer and chief inspection engineer.

The CHAIRMAN. For the Curtiss Co.?

Mr. MANLY. Yes, sir; Curtiss Aeroplane & Motor Corporation?

The CHAIRMAN. How long have you been in the employ of the Curtiss Co.?

Mr. MANLY. Since September, 1915.

The CHAIRMAN. Prior to that time what had been your occupation?

Mr. MANLY. I started work with Dr. S. P. Langley at the Smithsonian Institution on flying-machine work, taking charge of it for him on the 1st of June, 1898, and was engaged on that work throughout the entire period of development and testing of the machines and engines that we built for it, until the work was closed up through the lack of funds in December, 1904. From that time until I went with the British Government, the War Office Aviation Work at Canada, in the summer of 1915, as consulting engineer for them, I had been engaged in my own company in the development of machinery and in power transmission.

The CHAIRMAN. You have made a specialty of aviation ever since 1898?

Mr. MANLY. Yes, for the last 20 years.

The CHAIRMAN. During your connection with the Curtiss Co. have you had occasion to visit the front, and in that connection the construction and development of machines in Great Britain?

Mr. MANLY. I sailed from New York on January 31 to attend the Air Craft Standardization Conference in London which was

held immediately after we reached the other side and I attended those sessions until the middle of March in London, when I went over to France and visited the aviation manufacturing concerns over there, manufacturers of planes and motors, and also at the front, and afterward returned to England to continue the investigation of the factories and the processes, and gathering scientific data for assisting in the work over here, and returned from England to the United States, reaching here on the 17th of April.

The CHAIRMAN. Was that work over there done for the Curtiss Co., as its representative, or as a representative of our Government, or both?

Mr. MANLY. I went over to this conference as the representative of the Society of Automotive Engineers, and also as a representative of the Curtiss Aeroplane & Motor Corporation, in so far as the corporation was either permitted or requested to have a representative present. Incidentally, it was arranged that all of the people going over to this conference should also be considered as representatives of the Aircraft Board of the United States.

The CHAIRMAN. And your principal purpose was the standardization of the different kinds of machines?

Mr. MANLY. No, sir. The principal purpose of the trip was to have a conference with the British, and later with the French and Italians and the British, to see how far increased production of the allies could be assisted by our getting together and comparing and, as far as possible, unifying our different standards in the way of specifications for materials and designs of the smaller parts, such as bolts and such matters that enter into the aeroplane and motor construction. That would not only increase production facilities, which one country could add to that of another country, but also simplify the maintenance of supplies at the front, so that when the machines were damaged, parts or repair paraphernalia would be available, such as bolts, screws, and the standard fittings they use on any machines, whether of one nation or the other. We also exchanged information with regard to the technical difficulties in the way of materials, such as dope, varnish, and the various materials which enter into aeroplane construction and which cover a very broad field of industry and scientific development.

The CHAIRMAN. Have you kept yourself, during your connection with aviation, informed in regards to types of machines and engines and their comparative merits or demerits?

Mr. MANLY. I have kept myself very well informed as far as it was possible to get data on this side. However, as soon as the war began, it has been very difficult for us to secure data over here as to the work that was being done abroad, except by either making the trip abroad or by getting into the confidence of our own aviation section of the Army and securing information through them and most of that information has been held very secretly.

The CHAIRMAN. Let me ask you, as a general proposition, whether engines for aviation and planes for aviation can be developed along separate lines or whether engines and planes which are to use the engines should be developed together and as parts of the one machine? The idea I have in mind is, are engines for aviation and planes for aviation separate, distinct pursuits, or are they to be considered as two parts of one common end or purpose?

Mr. MANLY. Engines for aviation being a very highly developed and specialized machine necessarily form the heart of the machine, and the design of the machine must, therefore, be built around the engine. It is impossible to build engines and build machines without regard to each other and then put them together, any more than it is to build engines and battleships and put them together without having coordinated their design.

The CHAIRMAN. What is your opinion with regard to the adaptability of the Liberty motor with the Bristol type of plane as producing an effective and satisfactory result?

Mr. MANLY. The Bristol machine having been designed around a smaller motor, and the motor having a different arrangement of details, with regard to the supports and the various paraphernalia which are fastened onto it makes it an extremely difficult job to take a Bristol and modify it so as to make it receive the Liberty in as good a form as it would be possible to design a machine around the Liberty. On the other hand, the Liberty is in general a type of motor somewhat like the motor which the British had used in the Bristol, though the motor they used, the Rolls-Royce motor, was the smaller Rolls-Royce type, and, therefore, considerably smaller than the Liberty.

The CHAIRMAN. Do you think that, in consequence of that fact, the size of the Bristol should be increased, so as to harmonize with the increased size of the Liberty motor in order to make it a more effective machine?

Mr. MANLY. It would be impossible, or, rather, it would be hardly worth while, to simply increase the size of the Bristol. Any increase in the size of the machine usually means a redesign of the machine, and the Bristol was about as well adapted to taking the Liberty motor as any machine which had already been designed and used at the front, with which I am acquainted, at the time the Bristol was selected.

The CHAIRMAN. Is it your view, then, that for the purpose of securing the full effectiveness of the Liberty motor that a machine should be especially built around it, to use your expression, or designed for it?

Mr. MANLY. Not only one but several machines should be designed around it, and all very thoroughly tested, so that the one which gives the best performance can be used, but in the meantime I believe that we should produce the best thing that we can produce with what we have, using the Liberty motor as it is and using the drawings and designs which we have and get it in production so as to produce something that will immediately enable us to put up a fighting program on the western front, which is more than we can do with anything we have already sent there.

The CHAIRMAN. In other words, you think that we should use what we have already, rather than attempting to design some other motor?

Mr. MANLY. Yes, sir.

The CHAIRMAN. Do you know whether any planes are being especially designed for the Liberty motor anywhere?

Mr. MANLY. Yes; at least three are being specially designed in France to incorporate the Liberty motor by French designers, and our own subsidiary company, the Curtiss Engineering Corporation.

have designed and built and flown a machine especially designed around the Liberty motor, which is the first machine of this type that has been constructed as a seaplane.

The CHAIRMAN. What is the technical name of that?

Mr. MANLY. The Curtiss Engineering Corporation's H-A machine. It is practically the same general size as the Bristol, having somewhat larger fuselage and having provision for a four-gun equipment, and, as I am informed, it has already shown, with the heavy paraphernalia incident to a seaplane, a speed of 124 miles per hour, carrying this extra weight due to the seaplane.

The CHAIRMAN. Do you know of any efforts made in this country for the designing of a plane to be used as a war plane as distinguished from a seaplane, around the Liberty motor.

Mr. MANLY. The Curtiss Engineering Corporation have also completed their designs for making this either a land plane or a seaplane, so that using it as a land plane with regular landing gear equipment they are able to assure themselves from the tests already made that the machine would show a speed of from 130 to 136 miles per hour as a land machine, with full equipment.

The CHAIRMAN. Are you prepared to tell us what, in your opinion, are the properties and limitations of the Bristol equipped with the Liberty motor which this company is now constructing?

Mr. MANLY. I should say that the Bristol which is now being constructed with the Liberty motor, while being far from what we would like to see as a representative machine going from America, is still very much superior to anything else that we could quickly have gotten now, leaving out of account the sad features of the delays which have already been passed through, and the important thing now is that if we had a thousand of these Bristol machines on the front it would make an enormous difference in the situation as regards the Allied program.

The CHAIRMAN. That is to say, while they are not the most effective machines we can equip, it is the most effective machine that we can at the present time immediately equip for the existing emergency?

Mr. MANLY. I should say that the important thing is not to change what we have for something that is better until that better thing is so definitely developed and can be gotten into actual production so that there will be no lapse between the production of this thing we have and something better that is coming.

The CHAIRMAN. In other words, to keep up our present production of that machine while, at the same time, developing something better as coincident with our program?

Mr. MANLY. Yes, sir. Even if we found it necessary to scrap a thousand Bristol machines at any period of production it would have been much better to have provided those machines against delays in the production of new machines than to have held back because of this grasping for better things.

The CHAIRMAN. What do you think of the comparative merits of the use of the Liberty engine with the Bristol plane, as compared with the use of the Liberty engine with the De Haviland plane?

Mr. MANLY. The Bristol machine should give slightly better maneuvering characteristics than the De Haviland. The De Haviland I have seen flown at Dayton and noted that it gave a very good

performance, so far as casual observation of it would give. I saw it tested against the combination De Haviland four equipped with the 375 Rolls-Royce engine.

The CHAIRMAN. Have you made a careful study and examination of the Liberty motor?

Mr. MANLY. I have.

The CHAIRMAN. Will you please state concretely your view of the effect upon the efficiency of that engine of the angle between the cylinders as compared with what is called the 60° angle in most machines.

Mr. MANLY. The generally accepted standard arrangement for a 12-cylinder motor is having two sets of cylinders at 60°. The object in putting the cylinders in the Liberty motor at 45° was to narrow up the upper portion of the motor, thus contributing to the ease of stream lining and reducing the head resistance. The effect of putting the cylinders at 45° rather than 60°, is to cause a slight irregularity in the impulses on the crank shaft. I have not seen the Liberty motor under sufficiently varied conditions to be able to say whether or not any ill effect has been produced in it through having them at 45°, but I have understood from some people in whom I have considerable confidence as to their experience and judgment, that there has been no ill effect.

The CHAIRMAN. Would not the irregularity of the impulses have a tendency to increase the vibration of the machine?

Mr. MANLY. It would, but a good 12-cylinder engine is so smooth in its operation and free from vibrations due to unbalanced forces that it is questionable whether such a slight unbalancing of the impulses would produce any serious or seriously objectionable results.

The CHAIRMAN. What is your opinion of the Delco system of ignition used in the Liberty motor, as compared with other systems?

Mr. MANLY. While I have always personally preferred magnetos to any form of direct current ignition, yet I will say that from the perfection of detail that has been worked out in the Delco system as applied to the Liberty engine, I understand that is working very well indeed, and that there has been no trouble from any ignition source.

The CHAIRMAN. Would you say whether it is possible to use any other than the Delco system of ignition in engines constructed as the Liberty motor has been with the cylinders at an angle of 45 degrees?

Mr. MANLY. Any form of direct current ignition could be used such as the Atwater-Kent and several other such systems, by adapting them to it.

The CHAIRMAN. Then, the Delco is not the only form of that type of ignition?

Mr. MANLY. It is the only form adapted to that particular arrangement of cylinders, but there are several others that could have been just as well adapted by the designer of such systems, if he had seen fit.

The CHAIRMAN. Is the Delco a magneto system?

Mr. MANLY. No; a direct-current generator.

The CHAIRMAN. Is there any magneto system that could be used in an engine with cylinders at the angle of those occupied by the Liberty motor?

Mr. MANLY. By putting on four magnetos you can do so.

The CHAIRMAN. Would that increase the weight?

Mr. MANLY. Slightly.

The CHAIRMAN. Do you think it would be any more effective than the Delco system?

Mr. MANLY. I would have to have more information as to the Delco system as existing at present.

The CHAIRMAN. I wish you would give, as concretely as you can, your opinion of the Spad machine as a fighting machine.

Mr. MANLY. When I was in France in March and the first part of April, I visited 10 or 15 of the aeroplane manufacturing plants there, all of which are located within a short radius of Paris, and found a considerable number of these plants were very actively engaged in the production of Spads. I then inquired of such aviators as I met, who had come in from the front, and also later when I was up there, as to what they were getting in the way of performance from the Spads, and they all told me, each and all of them who had had any experience with the Spad, that it was giving unusually good results, and this was still further confirmed in my own opinion from the fact that the great French aces, Guyenemer and others, as well as our own aces, Lufberry and such men as that, were using Spad machines, and if they were able to achieve such results with them, it seems to me very natural that the machine must be one of the best class of machines out at the front.

The CHAIRMAN. You know that it is now being used?

Mr. MANLY. As late as April 2, it was not only being used at the front, but being produced in large numbers in France.

The CHAIRMAN. Do you think that the Hispano-Suiza engines used in this country could be adapted to the Spad machine readily?

Mr. MANLY. The Hispano-Suiza engine which was in production in this country at the time I went away from here last January was a 150-horsepower. The 180-horsepower, I understand, is in production now, although I have not seen it, and I know that the 180-horsepower Hispano-Suiza engine is particularly adaptable to that machine, although the French are using 220-horsepower engines, but the British have found a great deal of trouble with the 220-horsepower engines.

The CHAIRMAN. As compared with the S. E. 5, what is your opinion of the Spad?

Mr. MANLY. I feel quite certain that the Spad is the equal of the S. E. 5 in performance, and that both are good machines. I am not so sure that the S. E. 5 is quite the equal of the Spad.

The CHAIRMAN. The construction of the Spad machine, then, would be quite as available to us, would it not, in conjunction with the 180 Hispano-Suiza, as the S. E. 5?

Mr. MANLY. I should say, on the information that I have, it would be so.

The CHAIRMAN. If, as a matter of fact, this country could produce Spads in from 30 to 60 days quicker than it could produce the S. E. 5, for that plane, would you not say that it would be the very best policy to proceed with the manufacture of the Spad?

Mr. MANLY. Provided the engines for these Spads could also be procured within the same time.

The CHAIRMAN. Yes; that is assumed.

Senator FRELINGHUYSEN. I should like to ask Mr. Manly whether the committee that you visited Europe with, whether Mr. Diffen was on that committee.

Mr. MANLY. Mr. Diffen was the chairman of that committee.

Senator FRELINGHUYSEN. Have you made any report on the machines that were used effectively on the other side, to your company or to anyone?

Mr. MANLY. I am drawing up a formal report in the matter now, but have been so busily engaged on the getting of the work here in proper shape that I have not been able to complete the report since my return last month.

Senator FRELINGHUYSEN. It criticizes the various machines in use by all the allies?

Mr. MANLY. It does.

Senator FRELINGHUYSEN. Could we have a copy of the report for our information?

Mr. MANLY. I can give you such matter from it as you want, or a complete copy of the report when it is prepared, or if you can give me in advance a little information as to what the particular portions are which you would like, I could prepare those portions earlier. That report, of course, would have to be kept entirely confidential, because all the information which was furnished to us on the other side was furnished in the most confidential way. Personally, I think the Germans know as much about it as some of the rest of us who are investigating.

Senator FRELINGHUYSEN. Will you include in that what information you have about the German machines?

Mr. MANLY. Yes, sir.

STATEMENT OF MR. JAMES E. KEPPERLY.

The CHAIRMAN. What is your name in full?

Mr. KEPPERLY. James E. Kepperly.

The CHAIRMAN. What position do you occupy with the Curtiss Company?

Mr. KEPPERLY. Vice president and general manager and a director and a member of the executive committee, and a member of the voting trust.

The CHAIRMAN. And, of course, you are a shareholder?

Mr. KEPPERLY. No; I am not a shareholder. Personally I have no stock.

The CHAIRMAN. Personally, you are not interested in the business of the company, except as you are the holder of the positions which you have just enumerated?

Mr. KEPPERLY. Yes, sir.

The CHAIRMAN. How long have you occupied your present position with the company?

Mr. KEPPERLY. I came here in the latter part of January, after Mr. Morgan went away on his vacation.

The CHAIRMAN. Where were you employed prior to that time?

Mr. KEPPERLY. I was vice president and general counsel of the Willys-Overland Co.

The CHAIRMAN. With headquarters at Toledo?

Mr. KEPPERLY. Yes.

The CHAIRMAN. How long had you been connected with that company?

Mr. KEPPERLY. Ever since it was organized.

The CHAIRMAN. Are you a native-born citizen of the United States?

Mr. KEPPERLY. Yes. All of my great, great grandparents were born in this country, except one, who was a Holland Dutchman. I was born in Pennsylvania. I suppose I am a Pennsylvania Dutchman.

The CHAIRMAN. Do you know Mr. J. Alden West, I think his name is, who is the representative of the military intelligence bureau here?

Mr. KEPPERLY. I have met him once or twice here. He is the representative here at Buffalo.

The CHAIRMAN: Yes.

Mr. KEPPERLY. I have met him once or twice and only know him in that way.

The CHAIRMAN. Did you request by telegraph or otherwise, through Col. Horner, the transfer of Mr. Alden West from this plant to some other post of duty?

Mr. KEPPERLY. I did not.

The CHAIRMAN. Do you know of anyone connected with the company who did do so?

Mr. KEPPERLY. I do not. The only thing that I did ask at Washington was that they would consolidate their secret service here and not have so many branches of the Secret Service; that there were so many different branches of secret service that it was interfering with the production in the plant. We have the Navy Intelligence, Military Intelligence, Niagara Frontier League, Department of Justice, and our own Secret Service. I wanted that we be permitted to work through the Department of Justice. I desired that they would take out the Military Intelligence and the Naval Intelligence and permit us to work through the one department; that is, any information in any way interesting to the Government should be given to the Department of Justice, which is what we are now doing. The trouble with the Military Intelligence was that they were continually sending representatives to investigate the plant. They took up much time of our men and department heads.

The CHAIRMAN. You found that the system, so-called, consisted of four or five systems which interfered with the efficiency of the plant, and that they reduced the efficiency of each other and duplicated work which could be done better by a single system under one of the departments only.

Mr. KEPPERLY. Yes. As a matter of fact, Senator, my information was that the Military Intelligence and the Naval Intelligence, neither one had any power or authority. In other words, suppose we discovered a man out here doing something against the interests of the United States Government or the Curtiss interests; if we reported that individual to the Military Intelligence, they could not arrest the man. The Department of Justice had to be called in at the last moment to take it over. There was a man discovered in the engineering department with some blue prints or some data in his

trunk, and one of its representatives of Military Intelligence, together with one of our representatives, went to search this man's rooms, and while they were searching he came in and resented that they were searching his personal effects, and he refused to permit them to go through his trunk. Now, they could not do a thing. They had to call in the Department of Justice. They were working separately, distinctly from the Department of Justice, and finally they sent our man down to call on the Department of Justice, and the Department of Justice was not in a frame of mind to help them out because they said they always messed the thing up and they called in the Department of Justice to pull the chestnuts out of the fire. The Department of Justice representative did come finally, and through him only did they succeed in getting information. In the meantime the party was left alone long enough to hide everything that he had. The result was nothing was done to him.

The CHAIRMAN. Did the circumstances to which you have just referred influence you in your suggestion that the various branches of the intelligence work here be consolidated?

Mr. KEPPERLY. That was one of the things. Other things were fire protection. They have a fire protection system. They sent their representative down here and made a most exhaustive report and required that this company do certain things which would have cost us at least half a million dollars. Many of them were unreasonable things that the fire underwriters did not require. Then a short time after, a number of men came from the War Industries Board, and told us they were going to look after fire protection and they went through and made recommendations and said, "The Military Intelligence will not be mixed up in this thing again." The other day Military Intelligence was back with some new people to go through the plant. It is this constant going through the plant that tends to disrupt our organization.

The CHAIRMAN. To put it in a word, you have not asked for the removal or transfer of any special individual; you have simply attempted, because of these conditions, to recommend and urge a more efficient and single-headed system of intelligence?

Mr. KEPPERLY. Certainly, to be handled through one source, because I believe it would be a great deal more effective for both the Government and the Curtiss Co.

The CHAIRMAN. Have you been interfered with by any of the other airplane manufacturing concerns in hiring away your staff?

Mr. KEPPERLY. No, not to any great degree at all. There was some trouble early in the war. Mr. Morgan had some little trouble at that time, but since I have been here I do not know of any instance where I have had any trouble with the other plants hiring away our staff. We have had trouble with other manufacturers engaged in war work taking valuable men away from us. We have a case right now in the Victory plant, which is doing some work for the Navy. They are taking experienced men from our technical department men specially trained, and they are taking these men by offering very high wages, and offering other inducements. I took the matter up on Saturday with one of the managers of the Victory plant, and he promised that he would go into it and stop it because the word had gone out that the Curtiss people were in just as bad need of men

But I hear this morning that they have taken another man out this morning.

The CHAIRMAN. Have you put it up to the War Department?

Mr. KEPPERLY. I put it up to Mr. Landon the same time I had a letter from Col. Horner criticizing us for having ads in a Dayton newspaper telling us that we must stop the same and not try to get men from other aeroplane manufacturers.

The CHAIRMAN. The difficulty is that if one prominent concern does that the other sooner or later must do it for protection.

(Whereupon the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JUNE 5, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON
MILITARY AFFAIRS,
Detroit, Mich.

The subcommittee met at the office of the Packard Motor Car Co., Detroit, Mich., at 10 a. m., all members of the subcommittee being present, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF FRANCIS LYSTER JANDRON.

Senator REED. Will you please give us your name.

Mr. JANDRON. Francis Lyster Jandron, assistant secretary of the Packard Motor Car Co.

Senator REED. How long have you been connected with the Packard Co.?

Mr. JANDRON. Two years.

Senator REED. What is the capital of the Packard Co.?

Mr. JANDRON. It consists of \$13,000,000 of common stock and \$5,000,000 of preferred stock.

Senator REED. How long has the company been organized?

Mr. JANDRON. It was organized in 1899 as a West Virginia corporation, and reorganized in 1909 as a Michigan corporation.

Senator REED. It was engaged in the business of making automobiles, was it not, until the European War?

Mr. JANDRON. Motor carriages, trucks, and parts.

Senator REED. What is the extent of its plant?

Mr. JANDRON. We have an investment here of about \$45,000,000, employing from 10,000 to 13,000 men at different seasons of the year.

Senator REED. What was your output before you took these Government contracts?

Mr. JANDRON. Our sales for the last fiscal year ending August 31 last were a little over \$40,000,000.

Senator REED. That did not embrace war work?

Mr. JANDRON. We have had war work since 1914. We have shipped about 1,700 trucks abroad, but during that period we did not engage in a great deal of United States war work. The sales for the previous year were \$36,000,000.

Senator REED. The only war supplies you furnished before taking contracts for the present Government work were trucks and machine which you had been making in the regular course of your business?

Mr. JANDRON. Yes, sir.

Senator REED. That was the main business?

Mr. JANDRON. Yes, sir; exactly.

Senator REED. When was it that you got your first order from the United States Government for anything in connection with the war?

Mr. JANDRON. I think we got orders for trucks within 30 days after the war broke out.

Senator REED. Do you know the extent of that order?

Mr. JANDRON. It eventually developed into an order for 4,800, but we did not get it all at once. I remember that in May we were called on to furnish 124 trucks to be shipped to Gen. Pershing at the time he left the United States with his first detachment, and we later got an order for 1,800 and then 3,000, making a total of 4,800.

Senator REED. Have those orders all been filled?

Mr. JANDRON. The final shipment is to be made in June.

Senator REED. How much of that order has been actually filled to date?

Mr. JANDRON. We have shipped all but 500. The shipments were to be made at the rate of 500 per month and they have been made right on time up to the present moment.

Senator REED. What do you get for these trucks?

Mr. JANDRON. About \$3,500. A lot of special equipment makes the price fluctuate somewhat.

Senator REED. What is the engine power of these trucks?

Mr. JANDRON. I prefer that Mr. Hunt, the chief engineer, answer that question.

Mr. O. E. HUNT. It is somewhere around 35 horse, I believe.

Senator REED. In addition to the trucks for which you got contracts, you have, of course, other contracts. What was the next contract that you got outside of the trucks?

Mr. JANDRON. For repair parts to accompany those trucks.

Senator REED. What next after that?

Mr. JANDRON. I do not know of anything until we came to the development of the Liberty motor.

Senator REED. Which one of your engineers assisted in the development of the Liberty motor?

Mr. JANDRON. Up to the time he left us, J. G. Vincent, now Col. Vincent, was in charge of the work.

Senator REED. When did he leave?

Mr. JANDRON. In July, to accept a commission with the Signal Corps.

Mr. H. H. HILLS. He was on our pay rolls, I think, until September. We lent him to the Washington Government for some weeks.

Senator REED. He had been a mechanical engineer?

Mr. HILLS. Yes, sir.

Senator REED. What did he have to do with the development of the 12-cylinder Packard motor?

Mr. HILLS. He conceived the idea of a 12-cylinder Packard car and was the executive engineer in charge and the chief designer during the time that the car was being designed and produced.

Senator REED. That is the 12-cylinder Packard?

Mr. HUNT. Yes.

Senator REED. When was it you began developing the 12-cylinder Packard motor.

Mr. HUNT. I can not give the date exactly. But the first drafting work on the Packard 12-cylinder car motor was done on the Sunday following Christmas, 1914.

Senator REED. How long was it before you had the motor perfected to such an extent that you could put it to practical use in the cars?

Mr. HUNT. The first shipments in quantity of the 12-cylinder model were made in August of 1915.

Senator REED. It took practically a year from the time that the motor was conceived and put on paper to produce it, test it out and manufacture it in quantities so that you could begin the shipment of cars.

Mr. HUNT. Correct. I would like to correct my former statement. I think the records will show that quantity shipments did not begin until September, 1915.

Senator REED. I suppose you had—I am still talking about the Packard motor—I suppose you had, after you began manufacturing this motor to make a great many changes from time to time, and alterations, before it was perfected, and that it went through a period of experiments the same as other engines?

Mr. HUNT. Our original plans called for shipment in July, as I remember.

Senator REED. You met with some difficulties and had to rectify them?

Mr. HUNT. Yes.

Senator REED. When was it that Mr. Vincent was first called upon by the Government to do anything in relation to the creation of a new motor for Government use in connection with aeroplanes?

Mr. HUNT. I can not establish the exact date, but he left here for Washington on the 26th of May, 1917, and within two or three days thereafter he was engaged with Maj. Hall on the design of the Liberty motor.

The CHAIRMAN. Preliminarily to that Gen. Squier and Maj. Vincent had been in close touch with each other in experimental work that Mr. Vincent had been doing here in aeroplanes?

Senator REED. What was the very first work that Mr. Vincent did in connection with any aeroplane work, either before we entered the war or afterwards, and what was the history of it from the first, briefly? I am not speaking about Mr. Vincent's connection with the Government. The statement was just made that in May, 1917, he was called to Washington, but Mr. Jandron states that for some two or three years prior to that time, in connection with Gen. Squier, Mr. Vincent has been working on an aeroplane motor. Now, what I want to get at is just when that work began.

Mr. HUNT. I can not establish the exact date at which the Government was first apprised of our efforts in connection with the developing of an aeroplane motor, or when they first sent representatives here to see it.

Senator REED. Were you working on an aeroplane motor before the Federal Government asked you to take any part in it, or anybody connected with the Government?

Mr. HUNT. Yes, sir.

Senator REED. When did you first begin working on an aeroplane motor?

Mr. HUNT. We began our preparation—that is, our study of successful aeroplane motors then existing, with the purchase of a Mercedes car equipped with a Mercedes aeroplane motor in January 1915.

Senator REED. You mean that you purchased an aeroplane equipped with a——

Mr. HUNT. We purchased a car equipped with a Mercedes aeroplane motor.

Senator REED. You purchased an automobile?

Mr. HUNT. Yes, a racing car.

Senator REED. And it was equipped with a Mercedes aeroplane motor?

Mr. HUNT. Yes, sir.

Senator REED. And you used the aeroplane motor in the car?

Mr. HUNT. Yes, a small sized aeroplane motor.

Senator REED. How many cylinders did that have?

Mr. HUNT. Six.

Senator REED. When was it that you got that car and began your study of the aeroplane motor?

Mr. HUNT. We did not immediately begin our study of the aeroplane motor with the purchase of the car, but we got the car with the study of aeroplane motors in view, because it contained a motor which represented the best European practice at that time.

Senator REED. When was that?

Mr. HUNT. In January, 1915, that we bought the car.

Senator REED. Did you begin work very shortly after that on the development of an aeroplane motor?

Mr. HUNT. We began an intensive study of the Mercedes and other high efficiency motors, in the spring of 1915, and as a result of that study, began our first motor in November, 1915.

Senator REED. You produced your first motor at that time?

Mr. HUNT. We laid down the design of the motor, that is, we began the drafting work in a definite size in November, 1915.

Senator REED. Will you please briefly describe that motor as then conceived, cylinders, horsepower, etc.

Mr. HUNT. That was a 299 cubic inch, 12 cylinder, V type, overhead cam shaft aeroplane motor.

Senator REED. Describe the present Packard 12-cylinder motor?

Mr. HUNT. The 12-cylinder car motor, do you mean?

Senator REED. Yes.

Mr. HUNT. That is a 424 cubic inch, 12 cylinder, V type, L head motor.

Senator REED. What do you mean by V type?

Mr. HUNT. The center lines of the two rows of cylinders form a V.

Senator REED. At what angle?

Mr. HUNT. Sixty degrees for the car. Also 60 degrees for the first aeroplane motor.

Senator REED. Have you models of these engines here?

Mr. HUNT. Yes, sir.

The CHAIRMAN. What is an L head?

Mr. HUNT. When the shape of the cylinder head is such that both inlet and exhaust valves are on one side of the cylinder and operate by one cam shaft as opposed to the T head where they are on opposite sides, requiring two cam shafts.

The CHAIRMAN. Is that a radical difference?

Mr. HUNT. Yes.

The CHAIRMAN. Describe the present Liberty motor.

Mr. HUNT. It is a 1,650-cubic inch V type, 12-cylinder, overhead cam-shaft motor.

The CHAIRMAN. Will you please give us the Mercedes motor?

Mr. HUNT. I will have to make a guess at the piston displacement. It is approximately 400 cubic inches, six cylinder, vertical type, overhead cam shaft. You realize, of course, that this is a very general description.

Mr. HILLS. Mr. Hunt, will you please make clear the development between the first Packard motor and the Liberty motor.

Mr. HUNT. I had anticipated that the Senator would ask me about all these motors.

Senator REED. You have told us now—in order to get this in sequence—that you procured a Mercedes car that had a flying machine motor in it, which was a six cylinder motor, and you have described it, and then the development of the 12-cylinder motor by the Packard Co. for its car.

Mr. HUNT. Yes.

Senator REED. And then a 12-cylinder motor for flying purposes, by the Packard Company, and that you have described as 1,650 cubic inches, 12 cylinder, V type overhead.

Mr. HUNT. That is the Liberty motor. The first Packard was 299 cubic inches, 12 cylinder, V type, overhead cam shaft.

Senator REED. When did you get that 12-cylinder flying motor completed?

Mr. HUNT. In February, 1915.

Senator REED. Did you ever use it in practical tests in flying?

Mr. HUNT. In a plane, no. On a track, yes. We made it in a small size in order that we might do our experimental work on the track. It was not anticipated that the first motor would be the final model, but it had incorporated in it the details that we had decided to study for possible use in larger aeroplane motors. It was made in a small size and track-tested because Mr. Vincent and I were not afraid to use it on the track, and we did not feel so easy about the air at that time.

Senator REED. That brings us up to February, 1915. What were you doing in the meantime in the way of further development of aeroplane motors?

Mr. HUNT. We were working continuously on the drafting board on a larger motor of 905 cubic inches.

Senator REED. What did you do about that?

Mr. HUNT. We carried that design along, incorporating in it the changes that were dictated by our track experience with the smaller motor. Throughout the summer of 1916 we had track experience

with the smaller motor. The improvements that resulted from this experience were incorporated in the design of the larger motor as they were developed, and in December, 1916, we produced the first large motor.

Senator REED. Describe that please.

Mr. HUNT. That was a 905-cubic-inch, 12-cylinder, V-type, overhead cam shaft job.

Senator REED. What did you do in testing that; put it in a flying machine?

Mr. HUNT. We bought a machine to fly it in, but never flew it, because the flying machine was not a proper mechanical job, in our opinion.

Senator REED. Was the flying machine deficient or was it a fact that the motor and flying machine did not fit each other?

Mr. HUNT. No; because the machine was designed for the motor; and the two fitted, but we did not consider the plane a safe job.

Senator REED. Who made that machine?

Mr. HUNT. The firm is now the Standard Aeroplane Co., but they were operating, as I remember it, under a different name at that time. It was the same engineer and group of men who are now with the Standard, according to my understanding.

Senator REED. The Standard, of New Jersey?

Mr. HUNT. Yes.

Senator REED. You say that you furnished the specifications in June to these people and asked them to build a suitable machine for the engine, but they did not succeed in doing it. You knew at that time that every engine had to be fitted to the machine or vice versa?

Mr. HUNT. We were pretty certain of it; yes, sir.

Senator REED. That is even true of an automobile, is it not?

Mr. HUNT. Absolutely, if you want to get a good job.

Senator REED. Well, you tried this machine out on the track, did you?

Mr. HUNT. This larger motor?

Senator REED. Yes.

Mr. HUNT. After it was further developed, yes. If I may digress just a moment, the first 905 engine produced in December, 1916, had cast-iron cylinders. We had been working continuously throughout the summer of 1916 on steel cylinders. The first 905 engine equipped with steel cylinders was produced in February or March, 1917, and in the summer of 1917 was tested on the track. Of course, it had passed bench tests prior to that.

Senator REED. That was another 905?

Mr. HUNT. Yes. That engine, by the way, had an included angle between the cylinders of 40 degrees.

Senator REED. In February, 1917, you tried out a 40 degree angle engine?

Mr. HUNT. Yes; and in May, 1917, we built another 905, that was a 40 degree job.

Senator REED. That was steel?

Mr. HUNT. Yes, sir; equipped with steel cylinders.

Senator REED. Did you try out the machine that you made in May.

Mr. HUNT. Yes, sir.

Senator REED. In what?

Mr. HUNT. On the stand only.

Senator REED. Do these machines which you have described constitute all of the engines that you have worked on? I mean flying engines, up to the time that Mr. Vincent was called to Washington?

Mr. HUNT. These are the only types that were built. We did design work on other types.

Senator REED. You say Gen. Squier had been here working or consulting with Mr. Vincent prior to the time we entered the war. Was he here at the time you were experimenting and working on these various engines?

Mr. HUNT. Yes, sir.

Senator REED. Was he here frequently?

Mr. HUNT. No. According to my recollection, Gen. Squier, who was then a colonel I believe, was here not to exceed once or twice.

Senator REED. Do you know whether Mr. Vincent or he had had any talks about developing these motors for the Government, speaking now of the time prior to the time we entered the war? Tell us with perfect frankness all you know about it.

Mr. HUNT. I know that, initially, our efforts toward developing a high-power aeroplane motor did not meet any response or create any interest on the part of officials in Washington. After we had made motor samples we were visited at various times by representatives of the War Department, Col. Squier, Capt. Clark, Capt. Goodier, and others whose names I do not now recall.

Senator REED. So, that it may be stated in a general way, when the United States entered the war you had already been experimenting upon aeroplane motors, and had progressed far enough to produce a number of motors, none of which had ever been tested in flying machines and during some period of months you had been in more or less touch with Col. Squier and other officers?

Mr. HUNT. That is true.

Senator REED. They had begun to evince some considerable interest in the progress you were making?

Mr. HUNT. A very considerable interest at about the time that the war broke out. In fact, a contract for our final design of 905 motor was in the process of preparation at the time that Mr. Vincent went to Washington.

Senator REED. That is, after the war broke out negotiations were opened for a contract, and you were discussing the details of that contract when Mr. Vincent, now Col. Vincent, was called from your factory to Washington to see Gen. Squier?

Mr. JANDRON. I recall that we had a letter from Gen. Squier immediately after the war broke out, stating that time was an essential thing in making motors and authorizing us to make tools for the motors and that they could be subjected to any tests necessary, in order that the War Department might have the benefit of our experience in determining what type of motor they wanted to buy. All that was done to save time, and that the experiments might go on.

Senator REED. Up to this time that you speak of had you received any money from the Government?

Mr. HUNT. Not a cent.

Senator REED. Was any arrangement made, when you were asked to produce these tools, about the pay?

Mr. HUNT. None at all.

Senator REED. Have you ever been paid anything on account of your work?

Mr. JANDRON. We received \$3,500 on account of tools produced for an eight-cylinder Liberty motor after they decided to produce a 12-cylinder instead. That was a model Liberty motor.

Senator REED. Whatever you did at that time in the way of experimental work you did on the part of the Packard Co. and have never been reimbursed?

Mr. HUNT. We have never asked to be reimbursed, and we have stated in all our correspondence with the War Department and others that we did not claim any reimbursement for the development of the Packard motor.

Senator REED. When Mr. Vincent went to Washington what did he do there about motors?

Mr. HUNT. Mr. Vincent went to Washington in order to see if he could get a contract to build motors of our design.

Senator REED. This 905 motor?

Mr. HUNT. Yes. The plan was totally changed after he got there. When Mr. Vincent left Detroit he left here, as Mr. Jandron has brought out, with the intention of going to Washington and submitting the Packard 905 motor to the Government as a proper motor to be standardized for general aircraft use by the Government. In other words, he went from here to Washington carrying the standardization idea. At Washington it developed in the early conferences on the subject that it was desirable, from a military standpoint, to have a larger motor than the Packard motor. You are familiar with the development abroad, where the power required in military aeroplanes has stepped up progressively from month to month and year to year, and our motor, which was a 225 to 250 horsepower motor, was considered too small for a safe standard for future production. The standardization idea, however, was grabbed at as being extremely desirable, and Mr. Vincent was kept at Washington on arrangement with the Packard Co. to work with Mr. Hall on the design of a larger motor, which was to be the standard motor. Let me say here that the basic idea of the standardized motor program was a standard cylinder size of 5 inches bore by 7 inches stroke that could be used in either fours, sixes, eights, or twelves. The fours and sixes were for training and the eights and twelves for fighting purposes.

Senator REED. I am going to ask you to answer this question on a piece of paper, which you can put in the record later. I wish you would describe, as you have already described, only a little more in detail, each of these motors, beginning with the Mercedes motor that you got off the car, and going right on down through until you finally describe the Liberty motor. I want you to give the size of the cylinders and the horsepower and the angles and the types, etc., so that we may have a comparison between the different motors before the eye.

Mr. JANDRON. May I read a letter from President Macauley to Col. Deeds, which summarizes the history up to that time?

Senator REED. Yes.

(The letter referred to is here printed in full as follows:)

JUNE 11, 1917.

Mr. E. A. DEEDS,

Aircraft Production Board, Bureau of Standards,

Washington, D. C.

Dear Mr. DEEDS:—Aviation developments during the past two weeks have indeed been startling. They have had my principal thought since you proposed that we agree to your making Mr. Vincent, our vice president of engineering, chief engineer of the Aircraft Division of the Council of National Defense.

We have spent the last two years developing aviation motors, and have finally evolved an all-steel cylinder type which raised our hopes very high. Sunday a week ago Mr. Vincent and I had a conference at my home, at which we discussed plans for the manufacture of our motor in very large quantities, with the aid of other automobile manufacturers. The national need for motors in large numbers seemed to us so pressing, and the suggestion we discussed seemed so potential of results, that it was decided Mr. Vincent should immediately take the train to Washington to discuss the situation with your committee. And this he did. Arriving at Washington he was impressed with the fact—in contact with the French and English Commissions—yourself, Mr. Hall, Mr. Waldon, and others—that our design of motor is not ideal for the present needs on the Western front, which require an equal horsepower with a lighter weight.

Except in the matter of weight, our engineering development appears to be excellent, so that the problem presenting itself to Mr. Vincent was to incorporate the same steel cylinders and general design we had developed in a motor of lighter weight. This new view of the national needs is due to the fact that until the views of the visiting commissions were made clear to us and to the Government, our Government requirements called for severe test conditions which probably only a motor of the weight per horsepower as developed heretofore in our engineering department could hope to measure up to. The French and English commissions made it clear that endurance was subordinate to performance, and that light weight should be attained even at the sacrifice of ability to stand a 50-hour block test at maximum load.

It was made clear for the first time that the factors of safety heretofore regarded by Washington as essential should be sacrificed, perhaps by half, in order to give the motor an ability to drive a fighting plane, even for a brief time, at extreme speed.

When this new conception was brought home, Mr. Vincent and Mr. Hall, who has most splendidly collaborated with him, confined themselves in your apartment at the Willard Hotel, and in six or seven days designed a new motor embodying largely the engineering features developed during the last two years of our experimental work. Mr. Vincent went over these drawings with me in New York last Tuesday, and I was very much impressed with what had been accomplished; and when I heard the matter discussed again in Washington on Wednesday, in consultation with you, Mr. Waldon, Dr. Stratton, and others, I was confirmed in the belief that a very important national work had been accomplished.

You and Mr. Vincent brought to my attention the difficulty that would be met in attempting to bring out a new motor in tremendous quantities, if it should be known as a Packard motor. It was agreed, on the other hand, that the obstacles would be largely removed if it could be completed as to details and models as a Government motor, since under those conditions it would not only be possible to more readily enlist the support of Congress and the Government authorities, but also we could much more readily secure the aid and cooperation of motor-car plants and industrial concerns generally in an effort to produce parts and motors in quantities and at a speed heretofore undreamed of.

Since it was your opinion that Mr. Vincent was the man best fitted to aid you in maturing your plans for the production of this new motor in eight and twelve cylinder sizes, we have agreed to give him a leave of absence for 90 days in order that his entire energies may be devoted to this work. You thought 60 days would be sufficient, but we have extended the time to 90 days, in order to cover contingencies which are most likely to arise.

You will recognize, I know, that after two years' work and the expenditure of about \$400,000 it was not easy to give up our cherished ambition, which we hoped was about to be realized, of having the ideal aviation motor carry the name "Packard." It would have been a tremendous satisfaction to us to feel

in after years that the result of our early vision as to our country's future needs had been realized and recognized.

But it is clear to us, after considering the matter with you, that the national situation will be better if from this date the motor be known as a national development, and designated, I understand from you, as the "U. S. A.-8" and the "U. S. A.-12."

We therefore turn over the drawings and designs to you, together with Mr. Vincent and such members of the engineering staff as may be deemed necessary. The facilities of our engineering department, its talent, its tools, etc., are also at your command until this work is completed.

Yours, very truly,

PACKARD MOTOR CAR, COMPANY:
ALVAN MACAULEY, *President*.

Senator REED. There appears to be another letter here in relation to that letter.

(The letter referred to, dated June 18, 1917, is here printed in full as follows:)

JUNE 18, 1917.

Mr. E. A. DEEDS,

Aircraft Production Board, Bureau of Standards,

Washington, D. C.

DEAR Mr. DEEDS: I have just been reading over my letter to you of June 11, and it has occurred to me that possibly, in order not to be misunderstood. I should add that we are willing to make just about any concession within our power, in a cooperative way, during the period of the war. After the need passes, whatever we have handed over that is ours should be returned to us for our own uses and benefit. I have in mind particularly patents and organization.

Our engineering department, and our engineering facilities, under the impetus of Mr. Vincent's enthusiasm, have made great strides, as you will see when Mr. Vincent returns to Washington, which he should reach on Monday. The wood model looks finished and it certainly looks like the ultimate development. He will bring it with him in a special trunk. And we have done the work gladly and joyfully. We take some pride in the thought that no other company in this country certainly, as we believe, is organized and equipped to produce such results in so short a time.

Yours, very truly,

PACKARD MOTOR CAR COMPANY,
ALVAN MACAULEY, *President*.

Senator REED. Here is a letter of June 28, from Col. Deeds.

(The letter referred to is here printed in full, as follows:)

COUNCIL OF NATIONAL DEFENSE,
Washington, June 28, 1917.

Mr. ALVAN MACAULEY,

President Packard Motor Car Co.,

Detroit, Mich.

MY DEAR Mr. MACAULEY: Hope you will pardon the long delay to your letter of the 11th, but Mr. Vincent had it in his desk for some time and it got in the bottom of the pile on my desk, and between the two I have just come to it.

All that we can say is that we appreciate more than we can tell the broad spirit which has been shown by yourself and your organization and I hope some time next week we can have you down here and we can give you a little glimpse of the large program that is ahead of us. We are counting upon your organization to take a very heavy portion of this burden.

Sincerely, yours,

E. A. DEEDS,
Aircraft Production Board.

Senator REED. I would like to ask at this point whether you can fix the date when this conference took place between Mr. Hall and Mr. Vincent at which these plans were developed—the letter speaks of them being in a room for several days and getting out a plan.

Mr. HUNT. In the early days of June. Mr. Vincent went to Washington and several days were occupied in working out the plans for the standardization of the design. Then Mr. Vincent and Mr. Hall both came back to Detroit, bringing with them the layouts of the motor and the Packard company used them in making many detail drawings and a wood model that was built here, as mentioned in Mr. Macauley's second letter, which Mr. Vincent took back with him to Washington with a portion of the Packard organization to finish the job.

Senator REED. He took a lot of your draftsmen?

Mr. HUNT. Yes, sir.

Senator REED. Did he take any engineers?

Mr. HUNT. Yes, sir.

Senator REED. What engineers did he take, if you remember?

Mr. HUNT. Mr. McCain—they did not all go at the same time, but Mr. McCain and Mr. Wall were the principal ones—and draftsmen to the extent of about 15 or 16.

Senator REED. Some time back there was a reference made to a letter from Gen. Squier and you have handed me that letter and I think I will put it in at this point.

(The letter referred to is here printed in full, as follows:)

JULY 7, 1917.

From: The Chief Signal Officer of the Army.

To: Alvan Macauley, Esq., president Packard Motor Car Co., Detroit, Mich.

This is to confirm encouragement given to your Messrs. F. F. Beall and E. F. Roberts to proceed with the work of making preparations for the manufacture of the U. S. 8-A airplane engine. This assurance is given upon expressions of confidence by Mr. Beall and Mr. Roberts in the design of the U. S. 8-A engine after they had looked it over, and also because it seems best to run the risk of having to destroy one or two tools, if necessary, rather than to wait until we are perfectly safe, and in the meantime have nothing going ahead.

This encouragement is further based upon my confidence in your own business judgment directing this advance work along sane lines, and also upon the understanding that upon the motor being approved by the Joint Army and Navy Technical Board and satisfactory arrangements as to price being made that an order of substantial size will be given to your company just as soon as funds are available.

It is understood that such advance work as you may do upon the encouragement given to Messrs. Beall and Roberts will be covered in your proposal upon these U. S. 8-A engines, when submitted.

GEORGE O. SQUIER,

Brigadier General, Chief Signal Officer, United States Army.

Senator REED. Was that done?

Mr. JANDRON. Yes.

Senator REED. So, as a matter of fact, you did get your pay for your experimental work in this way. It was charged in as a part of the price when you came to get a contract?

Mr. JANDRON. You understand that contract is based on a cost-plus basis and only these tools made for the purpose of manufacturing the Liberty motor were counted in as part of the cost. All the tools necessary to produce the Packard motor were not so counted in.

Mr. HUNT. That relates to the tools for making the U. S. A.-8, not the tools for the making of the Packard engine.

Mr. JANDRON. The Packard engine was already in the discard when that letter was written.

Senator REED. The U. S. A.-8 was never made, was it?

Mr. HUNT. No, sir.

Senator REED. For what reason?

Mr. HUNT. It was considered of too small a horsepower.

Senator REED. Originally you had a proposition of four, six, eight, and twelve cylinders, and you were going to use these smaller motors in training planes, etc. Now, why is it that they did not go on and use some of them in training planes? They are heavy enough to drive a training plane, are they not?

Mr. HUNT. Yes. I believe that the policy not to use the smaller Liberty motors for training was dictated by the fact that several American manufacturers had in production motors of a size suitable for training purposes, and that, with the great tool-making load thrown on the country for purely military motors, and parts, it was not desirable to throw an additional tool load on the manufacturers.

Senator REED. Was that the general understanding that you gained from the general transactions and talk as you went along?

Mr. HUNT. I do not think that understanding has ever been given me directly by any Government official. It is my own notion to a large extent. It is the reasonable way of handling it.

Senator REED. I do not want merely your inner consciousness or speculation, because, while that might be valuable, it would not settle the facts. That is the reason I ask the question. Of course, a man in the long course of business gets a sort of knowledge which he can summarize. I understand this has been your own individual deduction.

Mr. JANDRON. Up to the moment that the contract was actually given us we were left in uncertainty as to whether eight or twelve cylinders were to be used, and I think the contract was ultimately made for twelve to satisfy the need for high power motors instead of training motors.

Senator REED. When did you get your first actual order for the motor which we will now call the Liberty motor?

Mr. HUNT. Immediately after Mr. Vincent's trip to Washington with the design of the Liberty motor. We were called upon to produce 11 experimental motors of that design, 6 eights, and 5 twelves.

Senator REED. Will you please tell me whether it is a fact that this Liberty motor is really the development of the Packard Co.

Mr. HUNT. I would rather not answer that question and have it go into the record. I would rather have you draw your own conclusions from an inspection of the motor parts which are visible.

Senator REED. You have told us that the Packard Co. was engaged in the business of developing a 12-cylinder steel motor, and you have given us a description of that motor as a 905 cubic inch, 12-cylinder, steel, 40-degree, V motor, with an overhead cam shaft, and you recognized that you would need a bigger motor for Government use, and the Liberty motor was made so that it has approximately 1,650 cubic inches, and it was 12-cylinder, was it not?

Mr. HUNT. Yes, sir.

Senator REED. And it was the V type and had the steel cylinder and the overhead cam shaft?

Mr. HUNT. Yes.

Senator REED. Now, in what way, except in the matter of size did it differ from your Packard motor that you had developed?

Mr. HUNT. It was based very largely on the Packard design.

Senator REED. Can you tell me what there was to distinguish it except the size of the cylinders.

Mr. HUNT. The Packard motor was of the reduction geared type, and the Liberty was not. The final Packard motor has——

Senator REED. The engine revolutions, by means of gears, were reduced, and its power correspondingly increased as it was applied to the propeller?

Mr. HUNT. That is it exactly.

Senator REED. You could, however, have omitted the gears and had a direct attachment without any change in the engine itself, a direct application?

Mr. HUNT. Yes, sir. It would merely have been necessary to drop off the reducing gear as you might take a transmission off a unit power plant for a car. It would not change the essential characteristics of the engine to do that.

Senator REED. And you could put on a reduction system that would reduce it a little or a great deal. It is just a mere matter of cog wheels, is it not?

Mr. HUNT. Yes, sir.

Senator REED. What other distinction was there?

Mr. HUNT. The cylinders of the final Packard motor were two in a block, two in a unit. The cylinders of the Liberty motor were one in a unit.

Senator REED. Is that an essential difference?

Mr. HUNT. It would make for improved manufacture, principally. That is, it would facilitate production to have them in groups of one rather than groups of two.

Senator REED. That is to say, when getting up a motor it might be made in a number of plants and in that case you would prefer making a separate cylinder, but there was no difference.

Mr. HUNT. It was to facilitate making it as a six, eight, or twelve.

Senator REED. That was a part of your scheme for a standard machine, to build in a complete section?

Mr. HUNT. We had the idea of four and six and eight and twelve in our Packard design.

Senator REED. What was the ignition system that you employed on your engine, the one that preceded the Liberty motor?

Mr. HUNT. We used magnetos on our 905 and Delco ignition on our 299.

Senator REED. The 905 was your final engine before you developed the Liberty motor?

Mr. HUNT. Yes, sir.

Senator REED. How many magnetos did you have to use on a 12-cylinder engine?

Mr. HUNT. Two duplex magnetos.

PACKARD MOTOR CAR CO.,
Detroit, Mich., June 6, 1918.

Hon. CHARLES S. THOMAS,

Chairman United States Senate Subcommittee on Aircraft Production,
Statler Hotel, Detroit, Mich.

DEAR SIR: This note is written to comply with your request of yesterday that I give you a statement with regard to the three distinct criticisms of the Liberty engine brought forward by Leon Cammen in his paper presented before

the Society of Aeronautical Engineers on May 28. In doing this, I shall eliminate theoretical consideration of the points criticized and confine myself to a statement of the results of actual experience with these features. I shall not deal with theory but with established facts. I am stating the criticisms in so far as is possible in the author's own words.

1. "The Liberty motor is not safe to fly" because the "oil sump drain plug" is seated by "a carefully ground joint and is held in place by a spring wire. There is not even a rubber gasket used."

Liberty-motor manufacturers had shipped up to the first of June 1,286 engines equipped with this construction, and a careful investigation has failed to disclose a single case of trouble, either on the test stand or in flight, occasioned by it. Further, 165 of these engines were shipped between Thanksgiving Day, 1917, and the 1st of March, 1918, which means that they passed their wide-open block tests during the extreme cold of the past winter at a power output much greater than is obtainable at high altitudes without a single case of the spring failure which Mr. Cammen fears. A ground joint is used in seating the plug, because it is an axiom of airplane-motor design that gaskets should be eliminated wherever possible, as they deteriorate rapidly in this severe service and may be disintegrated and cause dangerous leaks. Further, rubber is attacked by oil and should not be used for that reason.

2. "A construction practically untried has been laid at the basis of the design of the Liberty motor, and it is this 'adventure in engineering design,' unnecessary and wrong, that has lead to all the past delays and makes even now uncertain the final outcome of the work on the motor. In fact, the more we learn of the Liberty motor, the more clearly it appears that the 45° angle is a possible source of very serious vibrational phenomena, not a single European designer has been known even to try it out and that the world is continuing to use the 60° angle."

During the testing of the hundreds of Liberty engines already shipped, or the break-down testing of the experimental engines, there has not developed a single failure of any part that was, either directly or indirectly, traceable to the angle of less than 60° between the cylinders. The correctness of this principle had been successfully demonstrated in Packard airplane engines prior to the time the Liberty was designed. The principle has been successfully used by foreign designers, notably Renault, and approximately 2,000 engines of his manufacture containing this feature are now performing satisfactorily at the battle front. It will be patent to anyone who compares the 60° V-type engine with the 45° V-type engine of the same size and number of cylinders, that the latter will have a lesser frontal area than the former and that a fuselage built around it could have a lesser head resistance.

3. "The 45° of the engine blocks was such as did not admit the use of magneto ignition, or any system except the special Delco developed for it." In other words, "The Liberty motor was so designed that its success or failure was made dependent on the untried ability of the generator ignition to take care of exceptionally difficult conditions of operation. The ignition problem is still the weakest point in the operation of the engine."

The Liberty engine can quite readily be supplied with drives for four 6-cylinder magnetos, the only magneto equipment for large 12-cylinder motors that had been sufficiently successful in service to warrant consideration at the time the Liberty engine was designed. To use such a system would add between 30 and 40 pounds to the engine weight to cover the magnetos alone, without making any allowance for their drive. This weight comparison includes the battery, the generator, and the two ignition units, in the case of the Delco system. The essential principles of the Liberty Delco system had been thoroughly proved out prior to their use on the Liberty, on the Packard 299-cubic-inch airplane engine. This Delco-equipped engine holds all world's speedway records from 100 to 616 miles. In addition, it holds the world's record for distance traveled in one hour of 110 miles. The hundreds of Liberty engines already shipped are operating satisfactorily on their Delco ignition.

I trust this brief statement will give you the information you sought.

O. E. HUNT, *Chief Engineer.*

PACKARD MOTOR CAR COMPANY,
Detroit, Mich., June 6, 1918.

HON. CHARLES S. THOMAS,
Chairman United States Senate Subcommittee on Aircraft Production,
Detroit, Mich.

DEAR SIR: The following specifications of airplane engines was requested by your committee yesterday in order that they might include them in the record of their investigations:

Packard airplane engine model 1: Two hundred and ninety-nine cubic inches piston displacement, bore $2\frac{3}{4}$ inches, stroke $4\frac{1}{2}$ inches.

Twelve cylinders, V-type, 60° included angle.

Two-part crank case with bearings clamped between halves.

Scissors type connecting rods.

Aluminum alloy pistons with the piston pins locked in them by set screws.

Cast-iron cylinders with cored water jackets.

Valves in head with valve spring retained by tapered split key.

Overhead cam shaft carried in oil-tight housing with bearings lubricated through hollow shaft.

Crank type valve rocker arms, with shim adjusted and positively locked tappet having line contact with the valve end.

Cam shaft drive by spur gear train from crank shaft.

Dwco generator ignition with battery as auxiliary. Pressure lubrication, the oil passing from the main to the connecting rod bearing through passages drilled in the crank shaft.

Double outlet water pump, bevel gear driven from the crank shaft.

Two carburetors, each serving six cylinders.

Packard airplane engine model 2: Nine hundred and five cubic inches piston displacement, bore 4 inches, stroke 6 inches.

Twelve cylinders V-type, 40° included angle.

Two-part crank case with bearings clamped between halves.

Scissors type connecting rods.

Aluminum alloy pistons with the piston pins locked in them by set screws.

Forged steel cylinders, machined all over, and with sheet metal water jackets.

Valves in head with valve spring retained by tapered split key.

Overhead cam shaft carried in oil-tight housing with bearings lubricated through hollow shaft.

Crank type valve rocker arms, with shim adjusted and positively locked tappet having line contact with the valve end.

Cam shaft drive by spur gear train from crank shaft.

Ignition by two duplex magnetos.

Dry sump system of pressure lubrication. Oil fed from main bearings to connecting rod bearings through holes drilled in crank shaft.

Double impeller water pump with two outlets.

Two carburetors each serving six cylinders.

Packard airplane engine model 3: Nine hundred and five cubic inches piston displacement, bore 4 inches, stroke 6 inches.

Twelve cylinders, V-type, 40° included angle.

Two part crank case with bearings clamped between halves.

Scissors type connecting rods.

Aluminum alloy pistons with floating piston pin.

Forged steel cylinders, machined all over, and with sheet metal water jackets.

Valves in head with valve spring retained by tapered split key.

Overhead cam shaft carried in oil tight housing with bearings lubricated through hollow shaft.

Crank type valve rocker arms, with shim adjusted and positively locked tappet having line contact with the valve end.

Cam shaft drive by spur gear train from crank shaft.

Ignition by two duplex magnetos.

Pressure lubrication, dry sump system. Oil fed from main bearings to connecting rod bearings through holes drilled in crank shaft.

Double outlet single impeller water pump with automatic take-up of stuffing box.

Four carburetors, each serving three cylinders through manifolds forming across tie between cylinders.

Liberty airplane engine: 1,649 cubic engine piston displacement, bore 5 inches, stroke 7 inches.

Twelve cylinders V-type 45-degree included angle.

Two-part crank case with bearings clamped between halves.

Scissors type connecting rods.

Aluminum alloy pistons with floating piston pin.

Forged steel cylinders, machined all over, and with sheet metal water jackets.

Valves in head with valve spring retained by tapered split key.

Overhead cam shaft carried in oil tight housing with bearings lubricated through hollow shaft.

Crank type valve rocker arms, with shim adjusted and positively locked tappet having line contact with the valve end.

Cam shaft drive by inclosed bevel gears from crank shaft.

Delco generator ignition with battery as auxiliary.

Dry sump system of pressure lubrication. Oil fed from main bearings to connecting rod bearings through holes drilled in crank shaft.

Double outlet single impeller water pump with automatic take-up of stuffing box.

Four carburetors, each serving three cylinders through manifolds forming cross tie between cylinders.

The small Mercedes airplane engine: Four hundred and forty-three seven-tenths cubic inches piston displacement, bore 105 millimeters, stroke 140 millimeters.

Six cylinders, vertical type.

Two-part crank case with bearings clamped between halves.

Single type connecting rod.

Cast-iron pistons with piston pins locked in them by set screws.

Forged steel cylinders, machined all over, and sheet-metal water jackets.

Valves in head with valve springs retained by flange threaded on valve stem.

Overhead cam shaft carried in housing, slotted for rocker arms and with bearings lubricated from outside oil tube.

Lever type valve rocker arms with threaded set-screw adjustment and clamp bolt locked.

Cam shaft drive by uninclosed bevel gears from crank shaft.

Ignition by one 6-cylinder magneto.

Pressure lubrication, the oil passing from the main to the connecting-rod bearings through passages drilled in the crank shaft.

Single outlet, single impeller water pump.

Two carburetors, each serving three cylinders.

O. E. HUNT,
Chief Engineer.

Senator REED. How did they work?

Mr. HUNT Not at all satisfactorily.

Senator REED. Did the Delco system work satisfactorily?

Mr. HUNT. On the 299?

Senator REED. Yes.

Mr. HUNT. Yes, sir. It is still in operation.

Senator REED. You have some of those at work?

Mr. HUNT. Yes, sir. De Palma was at Sheepshead last Saturday in one of those cars.

Senator REED. You never did get the magneto working just right on your 905?

Mr. HUNT. No, sir.

Senator REED. That is, the one of May, 1917?

Mr. HUNT. Yes, sir.

Senator REED. You are an engineer, are you not?

Mr. HUNT. Yes, sir.

Senator REED. What is your opinion of this Delco system? I want all pride of manufacturing and everything of that kind taken out, because on this answer may depend the winning or loss of battles, so I want you to tell us whether the Delco system is all right, and, if not, what its defects are.

Mr. HUNT The Delco system for this type of motor is just as satisfactory as any type of ignition could possibly be.

Senator REED. Is it as good an ignition system as possible?

Mr. HUNT. For this type of motor, yes.

Senator REED. Do you know whether it has ever been tested at great altitudes?

Mr. HUNT. Yes, sir; on the Liberty motor.

Senator REED. Has it worked?

Mr. HUNT. Entirely satisfactory, as far as I know.

Senator REED. Is there any other system that is practically as good as the Delco system?

Mr. HUNT. For 12-cylinder engines? Not that I know of.

Senator REED. Is there any other system except the Delco that can be put on one of these V-type engines?

Mr. HUNT. Yes, sir.

Senator REED. What system?

Mr. HUNT. Four magnetos.

Senator REED. The four magnetos could be put on, but they have never been put on successfully.

Mr. HUNT. When I speak of being successful, Senator, I have in mind the ideal engineering results. Weight per horsepower is the most important characteristic of aeroplane engines. The aim is to secure a low weight per horsepower. It is totally impossible to get with the magneto installation the same low weight per horsepower as with the Delco system.

Senator REED. How much does it increase it?

Mr. HUNT. In the case of the Liberty engine it would increase the weight of the motor at least 40 pounds.

Senator REED. Increased in that way, would you have a system more reliable than the Delco?

Mr. HUNT. No, sir; less trustworthy.

Senator REED. The Delco system will fit on this V-type engine? Is there any other system outside of the magneto system that can be fitted?

Mr. HUNT. Other battery systems could be adapted to fit.

Senator REED. What other battery systems?

Mr. HUNT. Practically any other battery systems.

Senator REED. I will be plain with you. It has been claimed that this V type engine is so designed that no other ignition system except the Delco will fit onto it readily. Is that true or not?

Mr. HUNT. It is not true. Any type of battery system could be adapted to it, as far as I know.

Senator REED. Adapted without any labor or work that would be prohibitive in its nature?

Mr. HUNT. Yes, sir.

Senator REED. There are, however, none of these engines fitted with any other than the Delco system?

Mr. HUNT. Correct.

Senator REED. Do you regard the Delco system as the best system of ignition?

Mr. HUNT. Yes. I regard a battery system as best for this type of engine.

Senator REED. How long have you been a mechanical engineer?

Mr. HUNT. I have been with the Packard Co. since January, 1909.

Senator REED. Are you a practical engineer, a man that could go into the shop and work, or are you a theoretical engineer and student?

Mr. HUNT. I am not a machine-shop man. I did not come up through the shop. I have technical training followed by several years in the building business, this followed by my association with the Packard Co. All this time I have been in practical engineering work. I call it practical engineering, because the engineers of this company follow new designs all testing and development work in the production being done by them.

Senator REED. Are you a graduate of any technical school?

Mr. HUNT. The University of Michigan, department of engineering.

Senator REED. What year?

Mr. HUNT. 1907.

Senator REED. And since that time you have been right up against the practical side of the engineering game?

Mr. HUNT. Yes, sir.

Mr. JANDRON. We depend upon Mr. Hunt to produce models that can be actually manufactured.

Mr. HILLS. He not only designs the models, but turns over to the factory the final models from which the cars are built.

Senator FRELINGHUYSEN. Some criticism has been made of the Liberty engine. I have here a statement of criticisms of the engine as now constructed. I will only read part of it, but I am going to leave it with you gentlemen and ask you to prepare an answer for us before we leave this city. There are two or three questions in the beginning that I will ask you and let you insert the answers. It states that "in view of the conflicting statements made as to the design and production of the Liberty motor, the following purely technical discussion may be of help." There are just two questions of preeminent interest at the present time, and they are: First, is the Liberty motor as now made good to fly? Second, is it the best motor that we can have or does it have some radical defects of design that will prevent it from reaching the highest possible state of perfection? Perhaps a third question might be in order, to wit: Third, have important errors of design been permitted in the past which have delayed the production of the motor and prevented it from reaching a production stage at an earlier date? The following facts may help answer these questions. May I, in this connection, add that we have carefully eliminated all matter not conducive to the purpose of producing that immediate result which we are all anxious to see eventuate, viz, that our boys in France should take part in the aerial warfare. I do not wish to criticize anyone who has made an honest mistake and do not wish to touch upon matters not of technical interest. In fact, it is only because, to the best of my knowledge, there are so few independent engineers with a knowledge of aeronautics who are in a position to offer an unbiased criticism that I venture to write at all.

The first question is then whether the Liberty motor as now made is good to fly. It is with the greatest regret that one has to state that, unless changes have been made in the last two weeks, the Liberty motor is not safe to fly.

There is in the motor a so-called oil sump drain plug. The purpose of this contrivance (used on all motors) is to drain off the oil for cleaning the motor and renewing the lubricant. It is located at the very bottom of the crankcase so that the oil would drain off in the shortest possible time. In the Liberty motor this plug is about three inches in diameter and if removed would drain the entire oil in about one minute. The writer was amazed to find that, contrary to the usual practice all over the world, this plug was not screwed in and properly secured by a nut-lock, but has a carefully ground joint and is held in place by a spring wire. The system is exactly the same as that used on Mason fruit jars, but much inferior in the respect that in the Mason jars there is placed between the bottle and cap a rubber gasket, while in the Liberty motor there is not even a rubber gasket used. Hence, if a slightest piece of dirt should get in between the plug and its seat, the oil would drain out in about five to ten minutes, as one could see by making a little experiment. This is a construction in which an unnecessary hazard has been taken, and which is distinctly unsafe and undefensible. Further, the use of one spring wire for reliance in this most vital place of the motor is the poorest piece of engineering that the writer has seen in all his sinful life. The motor is apt to go up with the plane to considerable heights where it is sometimes, especially in winter, very cold, and those who have lived in cold climates know how easily steel snaps when very cold. But the piece of wire on which, in this case, the life of the men in the plane is hanging in the most literal sense of the word, is, in an airplane at great altitudes, subject not only to intense cold, but also to vibration.

The cold makes it brittle and the vibration does the rest, with the result that the plug is apt to fly out, the oil run off and the engine "freeze." Why not replace this construction by the usual threaded plug with a nut-lock? Why take chances with the lives of our boys? The writer believes that the matter is so serious that it would be worth while to recall every Liberty motor and to replace the drain plug of the present dangerous design by one of sane construction. A motor without oil too often means a dead aviator, and, frankly, the writer would not care to fly in a motor where his life depended upon a construction which, as an engineer, he knows to be absolutely wrong and unnecessarily dangerous.

This criticism comes to us and we are not technical men and know nothing about it. It is supposed to be a criticism by an expert engineer. What have you to say about that criticism and that statement?

Mr. HUNT. I consider the construction that is being criticised as absolutely all right. It is proved by hundreds of hours of flights to be perfectly satisfactory and all right.

Senator REED. Do you use the oil sump drain plug?

Mr. HUNT. Yes. I would like to show you the construction of it in the shop on the job.

Senator REED. Is it secured by a nut-lock?

Mr. HUNT. It is not, but the wire spring engages in a way to prevent the—

Senator REED. The statement of construction made by this engineer in this document is correct?

Mr. HUNT. It is fairly correct, yes.

Senator REED. But you do not agree with his deductions?

Mr. HUNT. I do not, and in that matter, I do not know of any type of effort in the world where you can get such a diversity of opinion as in engineering, and for any man to set himself up as a final court in such matters is at least presumptuous. There are often numbers of different types of construction that will work satisfactorily, and in automobile engineering in deciding on which to use we constantly compromise in order to get the combination of features that gives the best results from the owners, manufacturers, and designers standpoints, etc.

Senator REED. Would it be difficult or expensive to put in the kind of devices that this engineer has described as being the proper ones; any more expensive than the one you are now employing?

Mr. HUNT. I think the expense would be about the same.

Senator FRELINGHUYSEN. I will submit these questions and this letter, and I should like to have the questions in the letter answered, seriatim.

There is a very strong condemnation of the angle at which the motor is set. A statement that this is the only motor in existence with an angle of the cylinders at 45 degrees; that it was set at that angle in order to use the Delco system; that the system of ignition is not perfect and that the motor is wrong in design in that regard. The statement is also made that the Hall-Scott motor is set at 60 degrees, and that the Packard 12-cylinder engine is set at 60 degrees; that this is an experiment and is not perfectly successful. These are charges that have been made in a letter written by the Aeronautical Society of America and addressed to Senator Thomas, and are the criticisms of that society, together with a letter addressed to Senator Brandegee, of Connecticut, signed by Mr. L. Cammen, a mechanical engineer. I hope, for the information of the committee, that you gentlemen who are in charge of the construction of this engine will make your answer, because we shall seek further information as to these charges.

Mr. HUNT. May I have a few minutes of the committee's time to bring out a few points in regard to this cylinder angle. Unfortunately, I have no pictures here of a 60° motor of this same size. This [pointing to blue print on wall] happens to be a section of our Packard (005) motor which was set at 40°.

If you set it at 60° you would have ten degrees more angle of this cylinder with the vertical, and ten more degrees of this cylinder with the vertical. The motor would immediately widen out and the amount at the top, according to my recollection, was 7 inches wider than it is now.

Senator FRELINGHUYSEN. A 60° would be 7 inches wider than a 40°?

Mr. HUNT. I do not remember the figures on the Liberty motor. These are for our motor. In the Liberty it would be about 6 inches, as the Liberty is 45°. A very important factor in the performance of an aeroplane is the head resistance; that is, the resistance of the air to the passage of the wings and fuselage. The smaller the area the less the resistance will be. That is the fundamental reason for placing the cylinders at a lesser angle than 60°. Now, as to the engineering theories, and the engineering practical experience back of that to

show that it can be successfully done; a 6-cylinder motor—any 6-cylinder motor—has the crank pins on a circle in these locations; that is, they are 120° apart, so that in the normal type of six you have an impulse here when the crank shaft turns, and here, equally spaced, 120° apart, three impulses per revolution. You have equally spaced impulses in the 6-cylinder engine, three per revolution.

It is also an engineering fact that there is no vibration caused by the movement of the piston masses in the 6-cylinder engine, for the reason that the forces produced by moving the pistons up and down cancel out.

Senator REED. One is going up while the other is going down?

Mr. HUNT. One is at the top while the other two are at part stroke. The best way to state it is to say that the position of the center of gravity of all the pistons never moves, regardless of the position of the crank-shaft with the center of gravity, for all the distances never moves. When you get the 4-cylinder vibrations that you get at certain speeds on a 4-cylinder motor, it is due to the fact that the center of gravity of the four pistons is moving slightly in the motor. In a 6-cylinder the inertia forces cancel. It is obvious that two 6-cylinder motors, having the same characteristics, would also have no tendency to inertia vibrations. It is also true that if you take those two motors and combine them on one shaft at any angle, they still remain 6-cylinder motors. You introduce no new condition of vibration by combining them at any angle. In our car motor we combine them at 60° in order that we may get a uniform spacing of the six impulses per revolution. That is desirable, because in low-speed running, in using the motor in a vehicle where you want smooth running at low speed, you do not want two impulses, and then a blank space. It would tend to make the car operation not smooth at low speed, at idling speeds, about town. That condition does not exist at all in an aeroplane motor. The air fan does not require any power, practically, to drive it at low speed, so we are not taking any power off. We have no tendency to roughness, due to a required high-power output at low speed. In other words, the very conditions of operation of the motor in the aeroplane are such that you can not produce the unsteadiness that might exist at extremely low speed on a 12-cylinder motor of less than 60° in a car.

Senator FRELINGHUYSEN. Do you claim that the 45° angle decreases vibration?

Mr. HUNT. It would not decrease vibration because your two 6-cylinder motors are without vibration to begin with. I mean, barring out little vibrations, due to manufacturing variations, etc. Theoretically, you would get no inertia vibration.

The CHAIRMAN. You get the same results at 45° as at 60° ?

Mr. HUNT. Yes, as far as inertia vibration is concerned.

Senator REED. Are there any other differences?

Mr. HUNT. Nothing beyond the fact that your motor impulses are not uniformly spaced on the crank shaft.

Senator REED. Is not that desirable?

Mr. HUNT. No. Suppose you made a 6-cylinder motor of 1,650 cubic inches, it would have uniform firing, three impulses per revolution. It would be in perfect inertia balance. The blows on the crank shaft would be approximately twice as great as in the case of

the 12-cylinder motor of the same piston displacement. If you take that motor, now, and split it up into two 6-cylinder motors and put them at 60° , you get uniform spacing with impulses of half the amount. If you put them at 45° , you have impulses of half the amount, and you are coming up toward the 6-cylinder result, but you are not getting in the combination anything that would not exist in a 6-cylinder engine of the approved type. This is a very difficult thing for an engineer to try to explain to a layman.

The CHAIRMAN. May I ask a question now without interfering with your statement?

Mr. HUNT. Yes, sir.

The CHAIRMAN. You said a moment ago that because of the necessity of reducing the resistance of the air in flying machines, it was necessary or desirable, at least, to place the cylinders at a sharp angle. You stated that it was, I think, in one instance 7 inches, and in another 6 inches. We noticed in Buffalo that the radiation system consisted of two radiators placed in the fuselage at right angles, thus increasing the air resistance. If you have to resort to that kind of radiation in the plane, do you not produce the very added resistance which you seek to avoid by decreasing the angle of the spacing between the cylinders?

Mr. HUNT. Yes, but that is a matter that is outside the motor design.

The CHAIRMAN. Is it?

Mr. HUNT. Yes, sir.

The CHAIRMAN. We understand that some of the defects discovered in the mechanical operation of your Liberty motor was that you did not have sufficient radiation space, and that the only way in which you could get that space and have it sufficient for the power of the motor was to put these—I call them wing radiators—at right angles from the side of the fuselage. One theory is that it reduces the speed of the engine.

Mr. HUNT. It would tend to; yes, sir.

The CHAIRMAN. Have you not, in your radiation plans lost what you might have gained in the different construction of the pistons?

Mr. HUNT. The radiation, Senator, is not a part of the motor design, and was not designed by the motor engineers.

The CHAIRMAN. Well, it is a very essential element of any engine.

Mr. HUNT. It is a very essential element to the success of the engine, and to the success of the plane. The proper measure of the cooling system of the engine itself is the number of heat units that it puts into cooling water per horsepower developed. Judged on that basis the Liberty engine is on a par with other engines of like horsepower. If somebody chooses to put a small radiator up in front of it, they have no more right to blame the engine than I would have to take a Packard car and reduce its radiator by half and blame the engine.

The CHAIRMAN. It is a question of the efficiency of the engine which depends upon its radiation. Did not the Packard engineering force design the type of radiation space as well as the engine which is an essential part of every engine?

Mr. HUNT. That would get us into a lot of detail as to the way in which this engine was designed.

The CHAIRMAN. But, if the efficiency of the engine is really reduced by the inefficiency of its radiation system, necessitating a larger radiation surface, then, of course, that would be a very important factor to be considered in the development of our aviation program?

Mr. HUNT. The point I want to make clear is the fact that this Liberty engine in the matter of its discharge of heat to the cooling water per horsepower developed is on a par with other aviation engines.

Senator FRELINGHUYSEN. That is challenged by this document.

Mr. HUNT. Has he any facts to substantiate the challenge?

Senator FRELINGHUYSEN. Yes.

Senator REED. If I understand your diagram which you were going to undertake to explain to us for the purpose of explaining the coordination of the impulses in the 12-cylinder 45-angle engine, you mean to state that if these cylinders were at a 60° angle like you had them in your motor car, then they would more perfectly harmonize and coordinate than they do at 45°, and that is the reason you have them at 60°?

Mr. HUNT. For car service, yes; and for aeroplane service, no.

Senator REED. I can not understand if these impulses are not perfect at 45° going at a slow rate in a motor car so that a vibration results—does a vibration result?

Mr. HUNT. An unevenness of impulses would result at low speed.

Senator REED. If there is an unevenness of impulses at low speed that unevenness of impulses comes from the fact that the harmony of motion is not complete, and if your harmony is not complete at low speed, how could it be complete at high speed?

Mr. HUNT. My statement, perhaps, was not clear on that point. You would have the unevenness of impulses at low speed that in a car produce a result that is unpleasant, or might produce a result which is unpleasant to the owner. In the case of high speed you can not distinguish that unevenness of impulses. In other words, it is not that the unevenness of impulses does not exist at high speed, but there are no unpleasant results due to unevenness at these speeds.

Senator REED. That unevenness of impulses existing at high speed must produce a strain somewhere.

Mr. HUNT. That is taken into account in the design of the motor. For instance, we mentioned a while ago a 6-cylinder motor of 1,650 cubic inches. That would have impulses here and here and here, approximately twice in size what you would get in a 12 cylinder. Those impulses, being larger would require larger bearings, and a larger crank shaft. In a 12-cylinder, 60°, the impulses would be reduced to half the size, and you would get three other impulses as shown here of half the size. The bearing size could then be reduced, and the crank-shaft size could be reduced. As you render the impulses uneven, you are going back toward the 6-cylinder result, and the crank shaft and bearings would need to be slightly heavier than in the 12-cylinder design.

Senator REED. That is to say, because you made the angle 45° instead of 60°, you had to increase the weight of the parts?

Mr. HUNT. Yes, sir. We had to increase them slightly, because we were getting toward the 6-cylinder result.

Senator REED. And that is because there is this—I will use the term “unevenness”—of the plane of force or irregularity of im-

pulses? Those terms may not be absolutely correct, but you get my idea.

Mr. HUNT. I think that expresses it.

Senator REED. So that in order to economize on head space you balanced that advantage against whatever disadvantage there was arising from the extra weight that was made necessary by lack of uniformity of stroke which comes by virtue of the 45° angle instead of the 60° angle?

Mr. HUNT. Yes, sir. That brings you back to the idea of compromise. In getting this result you have to sacrifice something for it.

Senator REED. What is lost in power is lost in velocity and what is lost in velocity is lost in power, and if you put on extra weight to gain extra strength you pay for it in some way?

Mr. HUNT. Yes.

Senator REED. I would like to go into the matter of radiation now. How can the radiation on this 12-cylinder engine be placed so that it will cool the engine to the necessary point without decreasing the speed?

Mr. HUNT. I think it is safe to say that it is impossible to make any radiator installation at any point on any class of aeroplane that will not decrease the speed over what you would get if you left the radiator off, because the character of action that you get in any radiating scheme is to move air over the radiating surface, and that produces friction and that is head resistance.

Senator REED. I understand that. You have to have radiators on every engine and every radiator you put on reduces speed. We were told that we can not get enough radiation over the head of the engine so that they have had to build side wings; radiators that stick out like wings on each side of the fuselage; at least that appears on the Bristol fighter.

Mr. HUNT. Yes.

Senator REED. Now, what about that?

Mr. HUNT. Radiators can and have been built in aeroplanes in several places, at the front of the engine, the nose radiator, as you would have on a car.

Senator REED. You have that on yours?

Mr. HUNT. On the De Haviland four. Don't call it ours, because we did not have anything to do with it except the motor, not a thing to do with the plane.

Senator FRELINGHUYSEN. Is not radiation an important part of the correct working of a motor?

Mr. HUNT. It is a very important part in the correct working of a motor, but the point is that this job has been done with one piece here and another piece over here without coordination.

Senator FRELINGHUYSEN. You have been making the motor and somebody else the fuselage and somebody else the radiator?

Mr. HUNT. Yes, sir.

The CHAIRMAN. You did not develop your twin six that way?

Mr. HUNT. No.

The CHAIRMAN. You say that you have had nothing to do with the radiation?

Mr. HUNT. Nothing at all.

The CHAIRMAN. By which you mean that you wash your hands as to the proper method of radiation put in. But the committee

wants to know whether radiation can be put on these motors in such a way as not to retard the machine's flight.

Mr. HUNT. You will retard the machine somewhat with any type of radiation. There is an installation on a plane which was built at the Packard factory from designs prepared by French engineers, in which the radiator is neither over the nose nor between the wings, but is mounted in the upper wing, where it retards the progress of the machine through the air probably less than in any other location.

The CHAIRMAN. Is there any more difficulty in putting radiation on this Liberty motor that will keep it cool--when I say "keep it cool" I mean sufficiently cool--than in putting radiation on any other equally powerful engine?

Mr. HUNT. No. Not if you say equally powerful, but if less powerful, yes. It is a well-known fact that the frontal area of an engine does build up in proportion with its power. A 400-horsepower engine would obviously require twice as much radiating surface as a 200-horsepower engine, but it might happen in the case of the 200 horsepower that the radiator would just cover the front of the engine, then, in the case of the 400, it would more than cover the front.

The CHAIRMAN. So that whatever you say as an engineer, that whatever difficulty there is in the matter of the radiation of the Liberty motor, that difficulty is inevitably attached to any machine of the same power?

Mr. HUNT. I believe that absolutely; yes, sir.

Senator FRELINGHUYSEN. Why was it that this defect in radiation was not discovered on the testing stand before it was put in an aeroplane?

Mr. HUNT. Because you can not produce flying conditions on a testing stand.

Senator FRELINGHUYSEN. But you are designing an aeroplane engine and the question of cooling is one of the important engineering questions?

Mr. HUNT. Yes, sir.

Senator FRELINGHUYSEN. Why did you not determine the perfectness of the motor and the cooling before you let it go into an aeroplane?

Mr. HUNT. We did.

Senator FRELINGHUYSEN. Did you establish a system of radiation?

Mr. HUNT. We did not.

Senator FRELINGHUYSEN. Is not a system of radiation necessary to a perfect motor?

Mr. HUNT. If you take any motor-cooling system, it can be divided into two major parts, first, the motor with which you put heat in the water, and the radiator with which you take heat out of the water. The Liberty motor puts no more heat per horsepower into the water than any other successful aeroplane engine, so it is just a question of making a radiator sufficient to handle that power outfit and to take a known value of heat per horsepower out of the water in order to get the best results.

Senator FRELINGHUYSEN. Was this motor designed to be used successfully in aeroplanes?

Mr. HUNT. Yes, sir.

Senator FRELINGHUYSEN. To be properly cooled?

Mr. HUNT. Yes, sir.

Senator FRELINGHUYSEN. Did you make any tests of this aeroplane engine for radiation before it left your stands?

Mr. HUNT. In connection with the radiator, no. We did determine in the early stages of the game in working under Col. Vincent's direction on the first experimental motors, that the motor gave more heat per horsepower to the water than other successful aeroplane motors.

Senator FRELINGHUYSEN. Why is it now that the radiation is defective and increased radiation has to be constructed?

Mr. HUNT. While I do not know this of my own knowledge, because I have not been consulted and have not been present at tests, my information is more or less hearsay, but the radiator types that have been used have not been efficient and the quantities of radiation used have not been sufficient for a motor of this power.

Senator FRELINGHUYSEN. The engine that you built will not work unless it has increased radiation in certain planes, the Bristol fighter for instance, and in other planes in which it has been tried, and it has been openly stated and admitted that the engine would not cool with the radiation as originally designed. Now, it seems to me that the Packard Co., manufacturing an engine for aeroplanes, should have solved the problem of radiation before it allowed an engine to go out of its shops. You have admitted that you have not solved the problem.

Mr. HUNT. Absolutely. I have admitted that we have not solved it because it is not our problem, and nobody from one end of this country to the other has asked our advice in connection with it.

Senator FRELINGHUYSEN. Who is to blame for that?

Mr. HUNT. I do not know that I could put my finger on him. Who is to blame for lack of coordination in the whole program?

Senator REED. Tell us about this lack of coordination. We did not come up here to try the Packard Co. We are not up here to try anybody. We want to find out what is the matter with this aeroplane business. We want to get these machines over the lines in France as fast as American ingenuity can get them there. We are not haggling about the dollars and cents it is going to cost and we think everybody should be perfectly honest and state the facts in the case, and we will try to keep them from being in any way penalized for it.

Mr. HUNT. When I speak of coordination, Senator, I want to be understood as doing it without any idea of personal criticism of anybody. It seems to me, all things considered, and bearing in mind that there was no organization to take up the job of producing an enormous number of aeroplanes a year ago, that a very useful and commendable work has been accomplished. The best way to illustrate what is meant by lack of coordination is to compare the way the job has been done with the way a car would be designed and listed by an automobile manufacturer; that is, the way a thoroughly organized company might perform a work of proper size for them to undertake. The combination of motor and radiator and plane would have been tested in the same way that the combination of motor and radiator and chassis all would have been tested in an automobile manufac-

mer's establishment—thoroughly tested—prior to the time that any production was allowed to go out of the door.

That is the ideal way of doing it under peace-time conditions.

Senator REED. What happened in this case?

Mr. HUNT. What happened in this case was that in the effort to accelerate production and bring nearer to the moment of the letting of the contracts for motors the time when the planes would be in France, the test of the plane and motor combination was not made until we were well into the program. The Packard Co. and others were given orders for the Liberty engine; they were to make an engine and nothing else.

Senator NEW. That is to say, that the Packard Co. and others were given orders for the Liberty engine and nothing else?

Mr. HUNT. Yes, sir.

Senator NEW. And then, some other factory was given an order for the production of aeroplanes?

Mr. HUNT. That is right.

Senator NEW. And other factories were given orders for the production of parts?

Mr. HUNT. Yes, sir.

Senator NEW. And then it was up to others to put the engine, to put the fuselage, and the wings, and the other things that make up the planes together; to assemble the machine?

Mr. HUNT. Usually the plane manufacturer does the final assembling work.

Senator REED. And it is because of this independent action that there has been the lack of coordination that you have spoken of?

Mr. HUNT. Because there has been independent action on all the units not preceded by a thorough test of the combination of those units.

Senator REED. That test would have taken time?

Mr. HUNT. Yes; and there is an opportunity for considerable difference of opinion, and considerable difference of judgment as to the wisdom of doing the job in the way it was done in an effort to accelerate production. I can not tell you, and no other living man can tell you, until the job is done and we can judge of results with hindsight instead of foresight.

Senator FRELINGHUYSEN. Do you mean to state that you believe it was because of the haste required in building this engine, that it was necessary to take a chance with the radiation without making a test? That when a man had to use these motors to fly with, that you put these engines out without proper radiation tests?

Mr. HUNT. What I mean to say is this, that the necessity for production might have seemed so superlative to the men in control of the program that they bet on their engineering judgment rather than on their actual experience with the plane-motor-radiator combination in the placing of quantity orders.

Senator FRELINGHUYSEN. Then this engine was built practically without radiation tests? Is that true?

Mr. HUNT. Contracts were let when there had been no tests of the engine in combination with the radiators in the planes. Does that answer your question?

Senator REED. I think it does. When you sent this engine to England did you know then that in certain types of planes, the Bris-

tol fighter, for instance, that it needed more radiation, that it would have to be built with two wings on each side to give it radiation?

Mr. HUNT. The Bristol fighter, as built in England, was equipped with a smaller motor than the Liberty. The radiation would naturally have to be increased when the motor size was increased.

Senator FRELINGHUYSEN. If you had been asked whether it would have been necessary to put more radiation on the plane, whether any one would have known that it would be necessary to put more radiation on the plane than was used in England, what would you have said?

Mr. HUNT. I would have said "Yes."

Senator FRELINGHUYSEN. I am a little fogged in regard to the testing business. Here is a motor that was built and they could have varied it in design and they had the opportunity to test the radiation. The question I am interested in is why the Packard Company did not find that this engine was not sufficiently cooled.

The CHAIRMAN. We had statements made before the whole committee last March on this subject and they, in substance were, that a number of these motors, two or three of them, were tried out at the Lake Charles flying field in Louisiana. The plane reached the elevation of something over 10,000 feet when it was discovered that the radiation was deficient and succeeding flights demonstrated the same result, so that Col. Deeds stated to us that that was a necessary method of testing the engine, including the radiator, and that all that it meant was that it would require added surface, and additional surface for the radiator, and that that could be put on with very little trouble and expense.

Mr. HUNT. The point that the Senator brings out is well taken. No bench tests could have been devised that would conclusively demonstrate whether a radiator was sufficient for the motor in actual flying conditions.

Senator REED. You have spoken about the fact that you have never been called upon to solve these difficulties since they have been developed. Have you been ready at all times to give them your advice? Have you assisted in solving this radiation problem? Have you been willing to go and help them if you had been asked to?

Mr. HUNT. Undoubtedly we would have been willing to, yes.

Senator REED. Do you think now, if called in, you could help solve that problem?

Mr. HUNT. I do not think it is necessary to call us in. There are plenty of good men on the job. In other words, the question, in my opinion, is not one of personalities but is one of failure to get a conclusive test prior to the time that quantities were coming through.

Senator REED. I want to touch one other question which is in connection with what you have said. How many changes have been made in this Liberty motor since you started to work on it?

Mr. HILLS. Since we started to produce it?

Senator REED. Since you regarded it as a completed motor. You started to produce the Liberty motor and had contracts for them.

Mr. JANDRON. Yes; and the basis of that contract was that the design was attached to the contract, so that is a pretty good starting point; but the changes were made since the date of letting the contract on September 4, 1917.

Mr. HUNT. I have no record of changes right up to date, but I remember giving Mr. Macauley a report on February 9. The number since that time was small as compared with the number before, but there had been 1,022 changes between September 4 and February 9.

Senator REED. What was the nature of those changes?

Mr. HUNT. They were of all kinds, divided into the following major classes: First, changes made to improve the performance, the military value of the motor; that is, its power performance or its service performance, its strength, etc. Second, changes made to facilitate manufacture—little modifications that might have been asked for by Lincoln or Packard or Ford or any other motor manufacturer, or might have been asked for by the production men on the job for the Government. Third, changes that were purely academic, like corrections of clerical errors in the bill of material, and changes in material specifications to permit of a broader choice of steels, for example, on certain pieces, etc.

Senator REED. Has there been any radical change; that is, anything that changed the engine in its essentials?

Mr. HUNT. There have been changes that changed the essential parts of the engine in strength that were quite radical, but no changes with the exception of one that changed the essential principles.

Senator REED. What was the one that changed the essential principles?

Mr. HUNT. A change in the oiling system.

Senator REED. When was that change made?

Mr. HUNT. In December.

Senator REED. And what was the nature of that change and what occasioned it?

Mr. HUNT. Failures of the lubrication of the connecting rod bearings. In the original design of the engine oil was delivered under pressure to the main bearings and the surplus seeped out of the ends of these bearings and ran down the crank cheeks to a scupper at the pin. From the scupper it was fed through the bearing by centrifugal action.

Senator FRELINGHUYSEN. What happened when the aeroplane turned over?

Mr. HUNT. When aeroplanes turn over in the air, that is, when they do the loop and things of that kind, the centrifugal action of the plane when it is turning over maintains the oil in its proper relation to the motor as it does the man in his seat.

Senator FRELINGHUYSEN. The engine does not go dry?

Mr. HUNT. The engine does not go dry; no, sir.

Senator FRELINGHUYSEN. What was the trouble that developed in this system of oiling.

Mr. HUNT. The difficulty was in controlling the amount fed to the pins, in getting a sufficient amount to slide down the cheek and be caught in the scupper and let out through the connecting rod.

Senator REED. Did you find that you could not control it sufficiently?

Mr. HUNT. Not successfully.

Senator REED. Then what did you do?

Mr. HUNT. Then the hole in the pin was plugged at the ends and a hole drilled back up through the cheek to another hole inside the

main bearing, which was also plugged at the ends, so that it was possible to feed oil to the interior of the shaft and have it run around to the pin bearing entirely inclosed. In other words, it was the difference between a catch-as-catch can system and a positive system.

Senator REED. You made that change in December?

Mr. HUNT. Yes, sir.

Senator REED. Did you find that the engine heated under the old system and got out of oil, and you were having real trouble with it?

Mr. HUNT. There had been cases of the burning out of bearings under the old system.

Senator REED. So you found a radical defect in the engine in that way?

Mr. HUNT. Yes, sir.

Senator REED. So, after all it was a defect that applied to the principles of the engine?

Mr. HUNT. Yes; to the principle of lubrication.

Senator REED. Why was it that the pressure system was not put in the engine in starting?

Mr. HUNT. The scupper system was one of the compromises.

Mr. HILLS. Will you please explain, Mr. Hunt, that the pressure system was in our engines?

Mr. HUNT. The system in the original Liberty engine, the scupper system, was the system used in the Hall-Scott engine and it was introduced into the Liberty motor by Col. Hall. His 4 and 6 cylinder engines operate on that principle. The Packard engines all had a full pressure oiling system.

Senator REED. What are his engines?

Mr. HUNT. The Hall-Scotts.

Senator REED. He put it in this Liberty motor?

Mr. HUNT. Yes. According to all the information we can get the scupper system operates quite successfully on his 4 and 6 cylinder engines, but this is a different proposition because the bearing duty is higher and a higher type of lubrication is required. It was found to be absolutely necessary to use the pressure system of lubrication on the Liberty.

Senator REED. Who discovered this defect?

Mr. HUNT. It developed in breakdown tests at the Packard plant.

Senator REED. What do you mean by "breakdown" tests? Do you set an engine up and test it until you produce a break?

Mr. HUNT. Yes.

Senator REED. That is to get the limit of its efficiency?

Mr. HUNT. To get the limit of its durability; yes, sir.

Senator REED. You discovered this in December?

Mr. HUNT. Yes.

Senator REED. Did you begin production by December?

Mr. HUNT. We produced 26 motors in December.

Senator REED. Before this discovery?

Mr. HUNT. It was in process of testing these 26 that this discovery was made.

The CHAIRMAN. Right there, Senator Reed. The announcement that this change was necessary was certainly not made known as early as December.

Senator REED. That is, not to the committee. We developed that fact, I think, late in March.

Mr. HUNT. It was probably late in February. I think it was late in February when this change was made effective on all production; that is, when it was agreed that the pressure system was so desirable that it ought to go into all engines. I will say "desirable" out of deference to the opinion of some other engineers that thought it was not necessary. I think it was absolutely necessary. We were told, in December, to change over to the pressure system after a certain number of engines had been produced, because it would delay production to a certain extent to change on all engines.

Senator REED. Who told you that?

Mr. HUNT. The local engineering office, which at that time was controlled by Col. Hall.

Senator REED. How many engines were to be made with the old system of oiling?

Mr. HUNT. I can not tell you exactly, whether it was five or six hundred.

Senator REED. Did you produce that many with the old system of oiling?

Mr. HUNT. We did not.

Senator REED. How many did you produce with it?

Mr. HUNT. We shipped probably somewhere between 100 and 150, which brought us up to the end of February, at which time a committee appointed by Mr. Coffin came out and made some tests on the engines and developed a second time what we had developed in December, the desirability of the pressure lubrication, and on the basis of that second development of its desirability we got authorization to make all engines with the pressure lubrication system. In other words, we got authority to take the delay in production that would be occasioned in changing to pressure lubrication.

Senator REED. How much delay would it have occasioned?

Mr. HUNT. I would say that in February, with the special method that they allowed us to use in changing the crank shafts over, it would have made about three weeks' delay.

The CHAIRMAN. Did you change the engines that had been produced up to that time by introducing these——

Mr. HUNT. Yes, sir. We made arrangement with the Signal Corps to have those engines changed over.

The CHAIRMAN. Where were they going, abroad?

Mr. HUNT. I believe 12 engines in the hands of the Navy abroad have not been changed over. I think the others have all been changed.

Senator REED. It was in the month of December that you discovered here by a breakdown test that there was a weakness in this oiling system.

Mr. HUNT. Yes, sir.

Senator REED. You at once notified the authorities in Washington, did you not?

Mr. HUNT. They had their representatives here on the job.

Senator REED. And they saw the result of that test?

Mr. HUNT. Yes, sir.

Senator REED. And they agreed with you at that time that some change was necessary?

Mr. HUNT. Some of the engineers did and some did not.

Senator REED. You lost from December, the date of this discovery in your plant, until the second test was made, in February, that much time before there was any attempt made to put the new oiling system in?

Mr. HUNT. No. We lost that amount of time that might have been devoted to efforts to put the new oiling system into our crank shafts which were already made up with the other oiling system. In December they told us to use up the crank shafts made up for the first system and not change them. In February they told us that all motors must be made with the new system.

Senator REED. Up to this time you had made 500 or 600, and then you were to go over to the new oiling system. Did you start at once in the production which was to come in after the 500?

Mr. HUNT. Immediately.

Senator REED. So you did not lose any time?

Mr. HUNT. The time lost was only the time that would have been devoted to changing over the crank shafts that had been made up with the first design of oiling system.

Senator REED. In other words, if you had known what you afterward learned, you would not have made that 500 under the old system, and had them sent back, but would at once have started to work and you could have gotten out that 500 and saved time?

Mr. HUNT. Yes, sir.

Senator REED. You think you lost about three weeks?

Mr. HUNT. Yes, sir. We very strongly recommended the immediate change to pressure oiling on all motors in December.

Senator REED. Who turned it down?

Mr. HUNT. Instructions as to the action to be taken came from Col. Hall.

Senator FRELINGHUYSEN. Was Col. Hall opposed to a change in the system?

Mr. HUNT. Yes, he was.

Senator REED. I wish you would give us a list of your production, the date of the first machine produced, and then on through until you get up to your large productions.

Senator FRELINGHUYSEN. In that breakdown test of the 26 engines, did you discover any defects in radiation at that time?

Mr. HUNT. There was not a breakdown test of 26 engines. Two engines were taken and subjected to breakdown tests; that is, continued wide-open running. We ran these two engines in 20-hour periods, and then pulled them down to see if anything had developed during the 20 hours. This was to see if any trouble was developing that could be detected before it caused a wreck, because it is always easier to discover weaknesses that way than to try to work back from a post-mortem to see what has happened first. As we ran one of these machines we had the other up here examining it, and then we traded motors, so that we had one going all the time.

Senator REED. In those tests did you discover any radiation troubles?

Mr. HUNT. No. Because there was no radiation in the set-up. You can not duplicate on the ground the conditions that exist in the air, so that you can not possibly check airplane radiation troubles on the ground.

Senator REED. How did you cool this engine?

Mr. HUNT. With water from the city mains passed through the water jackets. That is the method of supplying water to block test motors.

The CHAIRMAN. The tests can only be made in the air for radiation?

Mr. HUNT. Yes, sir.

Senator REED. If you were to put a radiator on an engine and the engine was stationary, screwed down to a wagon or a block, there would be no air circulation through that radiator at a rapid rate and it would not cool at that time.

Mr. HUNT. You would have eliminated the air circulation caused by the movement of the car or plane.

Senator REED. So that a radiator used on a machine that is stationary would have to be enormously larger than on a machine moving rapidly through the air.

Mr. HUNT. Absolutely correct. When we are considering a plane that develops 130 miles an hour it is easy to see that it would be entirely impossible to duplicate on a fixed testing stand the conditions as to air circulation that exist in a radiator traveling at that speed.

Senator REED. Even if you put up a fan.

Mr. HUNT. Yes; even if you put up a fan.

Senator REED. You have sent for those contracts? You have described one of the changes in this motor which you say was the only real essential one.

Mr. HUNT. The only change in principle.

Senator REED. What other essential changes did you find in that order?

Mr. HILLS. It might interest you to know that the kind of oiling system on our Packard car was the force feed, not the scupper feed.

Senator REED. The Government engineers consented that you put on the system which you had previously adopted in your own airplane motors?

Mr. HUNT. Yes. If you see the airplane motor parts upstairs you will find that the present system used in the Liberty engine is absolutely identical with the system used in the Packard engine.

Senator REED. The engines in principle are about the same thing?

Mr. HUNT. Yes, but there are differences in them.

Senator REED. As a matter of fact, this Liberty motor is really a development from the Packard flying motor.

Mr. HUNT. It is based on the Packard motor.

Mr. HUNT. It is absolutely impossible for anybody to bring out at this stage of the development of gas engines a motor that is entirely new. It is absolutely and totally impossible, and anybody who says that he did it is a liar. All mechanical development of this kind, as you know, is built on what has gone before. It is progressive. In the design of the Packard aeroplane engine the Packard company do not claim and never have claimed complete originality. They do not claim to have originated all the details that went into the building of that Packard aeroplane engine. They do claim to have made a serious study of the whole field of aeroplane engines prior to the time they laid down their first design, and to have taken the best, in their judgment, of all the features that have been used in aeroplane work before that time and to have used them in a Packard aeroplane

engine, and added to them certain new and original features that are covered by Packard patents to-day.

The CHAIRMAN. Their contribution, in other words, consists of selections they have made from the development of the industry.

Mr. HUNT. To state it broadly, they had the vision to see the need of this fighting motor prior to the time that anybody else in this country, including the Government, saw any need for it. The initiative to spend their own good money in the development of the motor over a period of years without Government encouragement, and at times even with Government discouragement, the good judgment to select and invent and put into these motors principles that have proven so successful that they formed the basis for this Liberty job, and, in addition, the patriotism to hand the result of all this effort over to the Government free of charge when the need for it arose.

Senator FRELINGHUYSEN. If we had had a Rolls-Royce working model here could you have made a Rolls-Royce engine?

Mr. HUNT. After a considerable period, yes.

Senator FRELINGHUYSEN. Did you have the working model or design of the Rolls-Royce or Hispano-Suiza or any of those engines to get studies from?

Mr. HUNT. When we built our Packard engine, no. We had the Mercedes and several other racing-car engines here. Racing service is quite similar to aeroplane service.

Senator FRELINGHUYSEN. But you did not have a study of the Rolls-Royce?

Mr. HUNT. We did not have it here, but Col. Vincent had drawings of it in Washington.

Senator REED. Has the Packard Co. some claim for compensation which it has presented to the Government?

Mr. HUNT. They are on record as not claiming or wishing to claim any compensation in connection with the development work done prior to the time that Col. Vincent went to Washington.

Mr. JANDRON. We have claimed compensation for all time lost by reason of the changing of the design of the motor while it was in production. No action has been taken on that claim. We have not claimed any compensation for the experimental work done preceding the time the contract was let.

Senator REED. How much is the claim?

Mr. JANDRON. We have not made any formal claim. It would amount to \$800,000 or \$1,000,000. In other words, our inability to get out production because of holdups by the engineering department and changes in process of going through. We figure those as losses by lengthening the time the contracts should be occupying our factories.

The CHAIRMAN. Were you responsible for any of those changes yourselves?

Mr. HUNT. We are and we are not. In theory, of course, the Packard Co. has not had a thing to do with it. The Government standardized the engine. They took our engineers to Washington and put up a laboratory to complete the design of the engine. We had no authority at any time to force into the engine the things we thought ought to go into it. After September 4—that is, after the time the production contract was let—we were still producing on the

experimental motor contract; that is, the contract for 11 experimental motors, and after September 4 we made suggestions to Washington for improvements in design that grow out of our experience on experimental contract work. Among these were suggestions that resulted in an increase of the horsepower delivered by the motor from 330 to over 400.

The CHAIRMAN. What was that change?

Mr. HUNT. A series of changes. A new intake heater combination which had been suggested by Col. Vincent, increase in piston clearance, and greater opening of the intake valves.

Senator REED. Let us see if I can shorten this matter. The truth about the matter is you had developed a motor in your own factory. Then Col. Vincent went to Washington, and the Packard 12-cylinder aeroplane motor was really made the basis for what Mr. Vincent and Mr. Hall designed in the Liberty motor. I am correct that far?

Mr. HUNT. Yes, sir.

Senator REED. Thereupon the Government sought to put these motors into production, but, wisely enough, provided for the making of a certain number of experimental motors. How many did they make?

Mr. HUNT. Eleven.

Senator REED. And in the contract for those 11 it specified that changes would probably have to be made.

Mr. HUNT. No, sir, not in the contract for the 11 because that was a development contract. It was understood that those 11 were purely experimental and that there would be constant changes.

Senator REED. You then started in making the 11 without any contract for production yet?

Mr. HUNT. Yes, sir.

Senator REED. And you made those 11 motors for the very purpose of finding how you could make them and where there were defects?

Mr. HUNT. Yes, sir.

Senator REED. Can you tell about when you got those motors completed and began those tests?

Mr. HUNT. The first 8-cylinder motor we shipped to Washington on July 3. The second 8-cylinder motor (you remember it was originally intended to produce the 8-cylinders first) was finished about July 25, was tested on the block, and then sent to Long Island and installed in an L. W. F. plane and flown. The first 12 were finished approximately the middle of August and put through a 50-hour run at the end of August, that 50-hour test being completed about the 26th of the month, as I remember, and our contract for production was signed September 4, before any additional motors had been produced or tested.

Senator REED. These changes which you speak of—the thousand and some odd changes—the necessity for how many of those changes was developed while you were working on the experimental engine? Was the greater part of them developed at that time?

Mr. HUNT. A very limited number.

Senator REED. Some time in September you had a contract for 6,000 motors. That is when you began quantity production, and it

was after that that these various other defects developed. Many defects developed and many changes, and a great many of those you people discovered here in your own plant and suggested to Washington that the change ought to be made for the good of the motor. You say in your answer that you were not responsible, Washington having contracted with you for a specific motor, Washington had to take the responsibility of the change, even after you suggested it.

Mr. HUNT. Correct.

Senator REED. But you did make the suggestion in the interest of a good motor?

Mr. HUNT. Yes; because under the terms of our experimental arrangement, that is, our experimental development arrangement we were under obligations to do that.

Senator REED. And you never did complete your experimental arrangements, before they rushed you into the making of these motors?

Mr. HUNT. We did not.

Mr. JANDRON. At the time that Washington submitted a contract for the 6,000 it was expected that there would be changes necessary, as happens in every form of manufacture, and the Signal Corps incorporated a clause in the contract that provided that six weeks' notice be given of all changes before we were required to put them in production in order to get the tools, etc., ready for them, and it was because we waived that clause to allow changes to be put in effect as soon as possible that the delay was occasioned. If the contract had been lived up to there would have been a period of six weeks.

Mr. HUNT. We waived that clause in the interest of a better motor to our detriment.

Senator REED. As a matter of fact, has it ever happened in the history of mechanics that a thing containing as many new elements and combinations of elements as this motor and in new sizes, has ever been made, and on the practical test it has not been found that many changes had to be made.

Mr. HUNT. Never, to my knowledge. That would be particularly true of a high efficiency job like this, where every detail is strained to the utmost.

Senator REED. If you were doing this thing commercially in ordinary times, could you have taken the time for experimentation before putting the engine into production?

Mr. HUNT. It would depend upon circumstances.

Senator REED. Assuming there was a market and you wanted to reach the market as soon as you could.

Mr. HUNT. We would have taken some chances, but made no decisions not based on previous experience and practice.

Senator REED. How long would you have taken as a matter of plain common sense business in handling it?

Mr. HUNT. We never would have placed quantity orders for the outfit until we had tested the whole thing as an assembled unit. We have some cases in our own business where we have gone ahead before the breakdown test had been completed and ordered some raw stock and got it in here in order to prepare ourselves in the plant. In these cases we have taken whatever loss might be occasioned by changes that grew out of the breakdown tests. Normally we do not do things in this way, however.

Senator REED. Ordinarily, in an ordinary business transaction, where there is no particular reason for haste except for the reason that you wanted to keep at work, you would have completed your engine and aeroplane and put it through severe tests before putting it into production and have taken the necessary time to do it.

Mr. HUNT. Correct.

Senator REED. And the delays that have occurred here, are they anything more than would naturally arise in doing a job in a hurried manner, as this was?

Mr. HUNT. I do not think so.

Senator REED. Has anybody been guilty of any acts of carelessness? Has there been any fundamental or radical blunder in connection with this job by anybody?

Mr. HUNT. Not to my knowledge.

The CHAIRMAN. What do you estimate your maximum capacity is for the production of the Liberty engine?

Mr. J. E. LOCKER. With the equipment that we have ordered and are installing, we should be able to produce 50 motors every day and the spare parts.

The CHAIRMAN. How soon can you do that? How soon can you put your quantity production at 50 a day?

Mr. J. E. LOCKER. In about 90 days.

The CHAIRMAN. What is your present capacity for production?

Mr. J. E. LOCKER. About 25 to 30 motors a day.

The CHAIRMAN. Supposing that this motor should not develop sufficiently and the substitution of some other should be required; have you examined the Rolls-Royce engine, and have you facilities for producing that engine or some similar engine if the emergency presented itself?

Mr. LOCKER. We would have to allow sufficient time for the heavier tools necessary to produce them.

The CHAIRMAN. Is that due to the system of measurements, or the character of the engine, or both?

Mr. LOCKER. To the English standard.

The CHAIRMAN. You could not apply the English standard without difficulty?

Mr. LOCKER. More so with the French.

The CHAIRMAN. Suppose for any reason the Government should find it necessary to begin the manufacture of a different engine, for example the Rolls-Royce engine, would you have any service capacity for immediate production?

Mr. LOCKER. No, sir.

The CHAIRMAN. So, in that event you would have to build from the ground up?

Mr. LOCKER. Yes.

The CHAIRMAN. Suppose that it became necessary to abandon the production of the Liberty engine and substitute for it some other engine of demonstrated superior construction; how long would it take you to get into quantity production of this other engine?

Mr. LOCKER. Taking into comparison the way we are handicapped by lack of good mechanics and tools, from six to nine months.

The CHAIRMAN. It might take until the war is over?

Mr. LOCKER. Yes.

The CHAIRMAN. Did the changes which have been made, and which were mentioned a moment ago—were they made by the Packard Co.?

Mr. HILLS. We know that some suggestions have been made from here, but every suggestion had to be approved by a Government engineer.

The CHAIRMAN. Are the Government engineers having charge of both construction and design stationed in Detroit or Washington?

Mr. HILLS. There is a production office here.

Mr. HUNT. Maj. Heaslet is in charge of all production and engineering in the Detroit district. He has not sole charge, and has to collaborate with the engineers at Dayton and Washington.

The CHAIRMAN. Their complaint has been that changes have been made not only that interfered with, but absolutely prevented construction, and many of those changes were sent from Detroit from a board of engineers of the Government.

Mr. HUNT. The contracts were mostly let in Detroit. I understand that Maj. Hazelett was given a free hand between the Government and the manufacturers.

Senator REED. The question I was on was whether when the engines got into production—I wanted to begin at the very start, but the papers are not available at this moment.

Mr. HUNT. We should not consider the experimental engines as being a part of the production. We produced the first one for the production contract on Thanksgiving.

Senator REED. What have you produced up to date?

Mr. HUNT. Under the contract: In December, 26; in January, 69; and in February, 165.

The CHAIRMAN. Those were all produced before you were authorized to place the forced system of lubrication in the machines?

Mr. HUNT. At the end of February we had 165 which had passed the final test, so these must all have been completed with the scupper system.

Mr. HUNT. I said that originally it was intended to have about 500 and between 100 and 150 were shipped before we got the final order to put pressure lubrication into all engines.

Mr. JANDRON. In March 153 passed the final test; April, 314; May, 439; 459 thus far in June; total to date, 1,144.

The CHAIRMAN. How many in process of construction?

Mr. JANDRON. Assembled, 1,275; 171 in the various processes of test.

The CHAIRMAN. What is your capacity going to be in production from this time on?

Mr. JANDRON. We have a schedule for this month of 700.

The CHAIRMAN. What for next month?

Mr. JANDRON. The ability to make it is dependent on certain machinery and tools coming. June, 700; 1,035 for July; 1,215 for August; 1,255 for September; the balance of the 6,000 in October.

The CHAIRMAN. You have only a contract for 6,000?

Mr. JANDRON. That is all.

The CHAIRMAN. Do you expect to be able to keep up with this schedule you have just read?

Mr. LOCKER. We expect to make that schedule provided we can get our tools and equipment as promised, and, from all indications, it looks as though we were going to get them.

The CHAIRMAN. You feel pretty confident about this?

Mr. LOCKER. I feel fairly confident of this amount of production.

The CHAIRMAN. How much of the facilities of this great plant are taken up now with the manufacture of these engines?

Mr. JANDRON. We estimate that 80 per cent of our facilities are on Government work, including trucks. Our truck plant is not used at all for aeroplane work. We are not manufacturing carriages at the present time.

The CHAIRMAN. When you say, "Not manufacturing carriages" you mean not carrying on the ordinary business of the Packard Co.?

Mr. LOCKER. Yes. We are not using the facilities which we need in making motors.

The CHAIRMAN. How much of the facilities are you using on these aircraft motors?

Mr. LOCKER. About 40 per cent.

The CHAIRMAN. Your work on these motors, on this contract, is going to be completed by what time?

Mr. LOCKER. We figure by the end of October.

The CHAIRMAN. That is only four months off?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. Is it or not necessary that you should have additional contracts at once in order that there may be no gap in production, and in order that you may be prepared with the proper raw materials, etc.?

Mr. JANDRON. It is entirely necessary, so much so that Mr. Potter, of the Aircraft Production Board, called Mr. Macauley to Washington to discuss that, and that is one of the reasons he is not here to-day.

The CHAIRMAN. In order to keep your production up to the point, am I correct in saying that you ought to know at least six months in advance what is to be required of you so that you can assemble your materials and have them on hand?

Mr. JANDRON. With the increase in difficulty in getting material we figure that seven months will elapse between the ordering of the material and the shipping of the finished article.

The CHAIRMAN. You are using 40 per cent of your facilities in making these motors. How much of that capacity could you employ in making other Government work; what per cent?

Mr. LOCKER. We figure about another 40 per cent. In other words, about 80 per cent on Government work, but all of that 80 per cent is not adaptable to making motors.

The CHAIRMAN. I understand you are making trucks, etc.

Mr. LOCKER. Yes. Our axle department can be put on aircraft motors, so by turning over all our facilities on aircraft motors, we could use 75 per cent of our facilities.

The CHAIRMAN. How soon could you do that?

Mr. JANDRON. In about 90 days.

Mr. LOCKER. That is impossible, because we have not the equipment for that.

The CHAIRMAN. What time do you say it would take?

Mr. LOCKER. I think six months.

Mr. JANDRON. This is simply for expanding the job we are on now.

Mr. LOCKER. That is true; but it is almost impossible to get the material to get up to 50 again.

The CHAIRMAN. The question I am trying to get light on is this: You are now straining along trying to get up to 50 a day, and you are using 40 per cent of the facilities of the plant, and another 40 per cent on Government work, and that leaves 20 per cent. Now, how soon could you get up to 75 a day by using all the facilities your plant has that are adaptable to the work?

Mr. LOCKER. About 50 per day?

The CHAIRMAN. And you say that is as much as could make?

Mr. LOCKER. Yes; unless you get extra equipment that has been outlined for that.

The CHAIRMAN. You say it would take about six months to get that extra equipment?

Mr. LOCKER. In some cases. I am judging by what it has taken on this work.

The CHAIRMAN. Is this factory capable of producing any other parts than the engines necessary to aeroplanes; that is, could you make the plane itself?

Mr. JANDRON. We are negotiating now with the Government to manufacture planes.

The CHAIRMAN. What are your facilities in that direction? How far could you go?

Mr. LOCKER. We have a big woodworking mill and a large amount of floor space. We have been building experimental planes there for some time.

The CHAIRMAN. Do you get all your cylinders from Ford?

Mr. LOCKER. Yes; all of them.

The CHAIRMAN. How soon did he begin to produce his rough forgings for you?

Mr. LOCKER. Very shortly after the contract was first signed.

The CHAIRMAN. Who tests these forgings that you get from Ford for their tensile strength?

Mr. LOCKER. By the Signal Corps. They have trained Government inspectors.

The CHAIRMAN. They test them before they come to your plant, or before they came here?

Mr. LOCKER. Before they come here.

The CHAIRMAN. How many planes can you produce if you get contracts, and I suppose that depends somewhat on the character of the plane, and so I will say of the character of the De Haviland four?

Mr. HUNT. The plane we are figuring on is not in production at all. It was developed by some French officers working in the factories.

The CHAIRMAN. Is it a fighting plane?

Mr. LOCKER. Yes, sir; there is a type of fighting plane among them.

The CHAIRMAN. I find that while all planes fight, there are the very rapidly moving planes, known as the fighting planes, the plane of attack. Are these planes that you are speaking of as experimenting on here the plane of attack?

Mr. HUNT. That is a two-seated fighter.

The CHAIRMAN. Did these French officers design it?

Mr. HUNT. They have developed several types.

The CHAIRMAN. Would that have the Liberty motor?

Mr. HUNT. Both the Liberty and Beugatti motor.

The CHAIRMAN. Who makes the Beugatti motor?

Mr. HUNT. The Beugatti motor was designed by Beugatti, an Italian engineer living in France, and was brought to this country by representatives of the Signal Corps at the end of December of last year.

The CHAIRMAN. Has it ever been built?

Mr. HUNT. Has it ever been produced in France? No.

The CHAIRMAN. Has it been produced here?

Mr. HUNT. A contract for 2,500 is in process now.

The CHAIRMAN. You got a contract for 2,500 before entering in production?

Mr. HUNT. We have not the contract. It has been let to an eastern concern.

The CHAIRMAN. Who has it?

Mr. HUNT. Dusenbery, I believe.

The CHAIRMAN. Have you a contract for any of them?

Mr. HUNT. No.

The CHAIRMAN. How do you spell that name?

Mr. HUNT. Beugatti.

The CHAIRMAN. Has this Beugatti motor ever been built and completed?

Mr. HUNT. Samples were completed and put through the French test in France with representatives of the Signal Corps present, and the motor was produced and brought to this country.

The CHAIRMAN. Before the plans were brought here, last December?

Mr. HUNT. Yes, sir.

The CHAIRMAN. So that the motor has been made in France?

Mr. HUNT. Experimentally; yes, sir.

The CHAIRMAN. But it has never been in quantity production?

Mr. HUNT. No, sir.

The CHAIRMAN. Who recommends it from over there?

Mr. HUNT. The technical section of the Expeditionary Forces, according to my understanding.

The CHAIRMAN. It has never been flown on the front?

Mr. HUNT. Not yet; no.

The CHAIRMAN. What is claimed for this motor?

Mr. HUNT. The most unusual feature is the mounting of about an inch or an inch and a quarter automatic cannon in the crank case shooting through the propeller housing. It has a rather high horsepower and a low propeller speed due to the reduction feature.

The CHAIRMAN. How high horsepower?

Mr. HUNT. Five hundred, and the motor weighs about 1,075 pounds.

The CHAIRMAN. You measure the horsepower by its effect on the propeller with this reducing gear in. Is that what you mean?

Mr. HUNT. Yes. By letting your motor speed run up, you see, the controlling factor in the reduction gear design is in the fact that

slower propellor speeds are more efficient than higher ones. You lose efficiency as you go up in propeller speeds, so the purpose of reduction is to keep the propellor speed apparently low, and let the motor run up and generate more power. You can not generate more power without a reduction gear.

The CHAIRMAN. How much horsepower had this motor?

Mr. HUNT. Five hundred; it is so reported.

The CHAIRMAN. You are comparing that at the same time with the Liberty, which would be 400?

Mr. HUNT. Yes, sir.

The CHAIRMAN. What is the weight of this engine?

Mr. HUNT. 1,075 pounds.

The CHAIRMAN. What is the weight of the 12-cylinder 400-horsepower Liberty?

Mr. HUNT. Approximately 800 pounds.

The CHAIRMAN. What particular features go with this French engine?

Mr. HUNT. The one important military feature is the cannon.

The CHAIRMAN. That is not a part of the engine. It is a part of the fuselage.

Mr. HUNT. No; the engine is constructed to receive the cannon in order to make a recoil basis for the cannon.

The CHAIRMAN. Have you ever tried that?

Mr. HUNT. That has been used on the front by Guynemer and other French aviators. In fact, Guynemer's latest success was with this class of plane.

The CHAIRMAN. This Italian is living in France?

Mr. HUNT. Yes. The cannon comes through the propellor shaft. Eight cylinders are in a line on one shaft and eight on another.

Senator FRELINGHUYSEN. Sixteen cylinders?

Mr. HUNT. Yes, sir.

Senator REED. The only way you can shoot is head on to a fellow and guide your cannon by moving your machine?

Mr. HUNT. Yes, sir; by the control of the plane.

Senator FRELINGHUYSEN. Is that a shell?

Mr. HUNT. They are using in this cannon both incendiary shells, high explosives, etc., in rotation.

Senator FRELINGHUYSEN. Is it a single shot?

Mr. HUNT. It is automatic. The ones developed up to date fire seven or eight shots. They have a full automatic in process of development, claimed to be successful on the other side, and work is being done on it here.

Senator FRELINGHUYSEN. Have the Germans anything of that character?

Mr. HUNT. They are reported to have; yes, from the latest French bulletins.

Senator REED. You get your forgings from Ford?

Mr. LOCKER. Yes.

Senator REED. Do I understand that is the block from which you make your cylinder?

Mr. LOCKER. It is a rough-forged tube.

Senator REED. Of course, you pay Ford for them, or does the Government furnish them to you?

Mr. LOCKER. I understand that the plan is that the Government should pay him and charge it against the cost of our job.

Senator REED. What else are you making now besides these engines?

Mr. JANDRON. Experimental aeroplanes that have been mentioned.

Senator REED. That is all?

Mr. JANDRON. That is all. That is, in addition to repair parts for the aircraft motors.

Senator REED. What suggestions have you made which will result in producing more aircraft or motors for aircraft more rapidly than we are getting them now? What suggestion do you make for the betterment of this service?

Mr. JANDRON. I should say one-man control and progressive civilians in control of the situation.

Senator REED. One-man control where?

Mr. JANDRON. In Washington. In other words, less committee work and less military interference with the work of production.

The CHAIRMAN. Have you not that now largely in the power given to Mr. Ryan?

Mr. JANDRON. We are hopeful that is the way it will work out.

The CHAIRMAN. What has been your difficulty?

Mr. JANDRON. The great desire to produce the maximum possibilities of the motor has led to a great deal of delay by one committee after another attempting to produce improvements in it. In other words, the desire to get a 90 per cent motor in the future rather than a 50 per cent motor now has interfered with the program as originally laid down.

The CHAIRMAN. What further suggestion have you to make, so that we can answer the question, "How can we better our airplane program?"

Mr. JANDRON. We have been very badly handicapped by the lack of tool makers.

The CHAIRMAN. Nobody can give you tool makers.

Mr. LOCKER. In the majority of cases when war was first declared, the majority of that kind of men enlisted because they were the brightest men. We would like to have released to us men of that character who have gone into the Army. We have 50 men detailed to us from Camp Custer and they are drawing the pay of soldiers and working alongside of our men who are drawing twice as much.

Senator REED. You would recommend that they be given the same amount of pay.

Mr. LOCKER. Yes, sir.

Senator REED. If they would do that, do you think others would be detailed here?

Mr. LOCKER. I think there are many men who much prefer to be in the camps, who should be detailed to work here.

Senator REED. Are there other men in the camps who could be obtained?

Mr. LOCKER. Undoubtedly there must be thousands of mechanical men in the Army, but it is possible that the Army needs them for the same kind of work in the service now.

Senator REED. Have you any other suggestion to make, gentlemen? If you had the problem presented to you that the Government has

presented to it, namely, to have planes for training in sufficient quantities, and then planes for advanced training, and then planes for bombing and planes for observation, and planes for fighting, and you had the problem presented to you that is presented now to our Government, of creating this great aircraft force in sufficient quantities to overcome the Germans, what would you do? How would you start about it?

Mr. HILLS. One thing I would do, I would check up to see that the production possibilities are balanced as between planes and motors. That may have been done, but to date motors are ahead of planes.

Senator REED. How much are they ahead of planes?

Mr. JANDRON. We have shipped from this plant 1,069 Liberty motors.

Mr. HILLS. I went to the Dayton-Wright factory, and they reported a capacity of only about 25 per day.

Senator REED. Have you people any contracts to furnish any of these motors to foreign Governments?

Mr. HILLS. Only through the Signal Corps. The Signal Corps does furnish some to the foreign Governments.

Senator REED. Your contract all told is only for 6,000?

Mr. HILLS. Correct.

Senator REED. You desire to have that contract extended in order to keep your plant running?

Mr. HILLS. If it is desired that we produce these motors, we should know it sufficiently in advance.

Senator REED. What is the paper you now give me?

Mr. HUNT. It relates to the delivery of the 11 experimental motors. (The letter referred to is here printed in full as follows:)

DETROIT, MICH., December 20, 1917.

Statement of experimental and standard production engines shipped by the Packard Motor Car Co. up to Dec. 20, 1917.

No.	Shipped to—	Date.	Shipper No.
8-CYLINDER ENGINES (EXPERIMENTAL).			
1	Dr. Stratton, Bureau of Standards, Washington, D. C.....	July 2, 1917	S-95364
2	Maj. J. G. Vincent, Engine Design Section, Washington, D. C.....	July 28, 1917	S-96235
3	.....do.....	Oct. 16, 1917	S-1568
4	.....do.....	Aug. 29, 1917	S-104160
5	.....do.....	Sept. 3, 1917	S-105175
6	Hudson Motor Car Co., Detroit, Mich.....	Nov. 15, 1917	S-98343
12-CYLINDER ENGINES (EXPERIMENTAL).			
1	Maj. J. G. Vincent, Engine Design Section, Detroit, Mich.....	Aug. 15, 1917	S-96162
2	Dayton-Wright Airplane Co., Dayton, Ohio.....	Oct. 6, 1917	S-102416
3	Curtiss Airplane Co., Buffalo, N. Y.....	Oct. 16, 1917	S-99391
4	Airplane Engineering Department, Dayton, Ohio.....	Oct. 26, 1917	S-96873
5	Held at the Packard factory for engineering tests.....	Nov. 17, 1917	None.

Senator FRELINGHUYSEN. Who is directly responsible for the changes in design and the corrections in the Liberty motor?

Mr. HUNT. At the present time for the Detroit district, Maj. Heaslet, district manager of equipment, under authority delegated to him by Maj. Gray in charge of the production engineering department.

Senator FRELINGHUYSEN. Then, those changes were directed by the Government, were they not?

Mr. HUNT. Absolutely.

Senator FRELINGHUYSEN. When you have discovered anything radically wrong in the mechanical construction, have you reported it to those Government authorities?

Mr. HUNT. Immediately.

Senator FRELINGHUYSEN. What has been your experience as a designer and manufacturer of motors as to the Government's attitude toward those recommendations? Do they work with you and cooperate?

Mr. HUNT. Yes, sir; they have shown a cooperative spirit from the start. The only possible question that could be raised in connection with that part of the development of the motor has been the fact that they did not get organized early enough in the game. They did not have the organization initially to do the work quickly; that is, to handle suggestions quickly. They are now in much better shape.

Senator FRELINGHUYSEN. Are they experienced men who know the construction of the motor?

Mr. HUNT. They have been successful in getting into their organization a very large number of such men.

Senator FRELINGHUYSEN. Are these changes that you have in all factories?

Mr. HUNT. Yes, sir.

Senator FRELINGHUYSEN. Then a motor turned out by the Lincoln Co. would be equal in efficiency to a motor turned out by the Packard Co., as far as design is concerned?

Mr. HUNT. Yes, sir; and interchangeable.

Senator FRELINGHUYSEN. Is the Liberty motor protected by patents?

Mr. HILLS. There are patents on some features. You had better ask Mr. Tibbetts about that.

Senator FRELINGHUYSEN. Mr. Tibbetts, is the Liberty motor protected by patents?

Mr. TIBBETTS. We have some patents already issued on the Liberty motor, and we have a number of applications pending in the Patent Office.

Senator FRELINGHUYSEN. Who own those patents.

Mr. TIBBETTS. The Packard Co.

Senator FRELINGHUYSEN. Does the Government pay any royalty for those patents?

Mr. TIBBETTS. No, sir. In accordance with those letters from Mr. Macauley to Col. Deeds we turned over to the Government all of our patent rights as far as their connection with the Liberty motor is concerned, during the term of the war.

Senator FRELINGHUYSEN. Does any other company manufacturing the Liberty motor have to pay any royalties to you?

Mr. TIBBETTS. Not to us; no, sir. As I say, we handed these over, so that the Government could have these motors made by anyone without the payment of royalties.

Senator FRELINGHUYSEN. In other words, whenever the Government wishes to utilize the facilities of any factory they can do so and give the Liberty designs to that factory to execute?

Mr. TIBBETTS. As far as our patents are concerned.

Senator FRELINGHUYSEN. You refer to this letter to Col. Deeds. Is that the only agreement there is in existence?

Mr. TIBBETTS. It is, as far as I know.

Senator FRELINGHUYSEN. Then, this letter is the agreement with the Packard Co. in reference to the protection of their patents?

Mr. TIBBETTS. It is the only one I know of. And I might add to that, I probably would know of it had there been any others, as I have charge of the patents here.

Senator FRELINGHUYSEN. Is there any official connected with the Packard Co. at the present time holding any position with the Government?

Mr. HILLS. Not that I know of.

Senator FRELINGHUYSEN. Has any official in the Government any interest in the Packard Co. as a stockholder or otherwise?

Mr. JANDRON. There is only one big stockholder that I know of that is connected with the Signal Corps—S. D. Waldon.

Senator FRELINGHUYSEN. Col. Waldon, a member of the Aircraft Production Board?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. He is a stockholder?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. Was he a stockholder at the time this agreement was made?

Mr. JANDRON. Yes, sir; and there was some correspondence passed at that time, and my understanding was that he made certain stipulations with the Secretary of War and the Council of National Defense on account of that fact, that he was a stockholder in the Packard Co. It is quite possible that Col. Vincent owns a few shares in the Packard Co., but only in a small way.

Senator REED. What do you think Col. Waldon owns?

Mr. JANDRON. About 2,000 shares.

Senator REED. At \$100 par value?

Mr. JANDRON. Yes, sir.

Senator REED. Will you produce for the information of the committee a list of stockholders and also any correspondence in relation to the fact that Col. Waldon is an officer in the United States Army and also a member of the board which executed a contract with you?

Mr. JANDRON. Yes, sir.

(Letters referred to are here printed in full, as follows:)

August 23, 1917

HOWARD E. COFFIN, Esq.,

Chairman, Aircraft Production Board,

Washington, D. C.

DEAR SIR: The United States Government is about to enter into contracts with various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Co., owning both common and preferred stock.

Under the circumstances, I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company.

Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

I am sending a copy of this communication to each member of the Aircraft Production Board, and also to the Secretary of War.

Very truly yours,

(Signed) S. D. WALDON
Equipment Division—Signal Corps.

MEETING OF AUGUST 27.

As the Packard Co.'s contract was announced for discussion Mr. Waldon withdrew from the meeting. By order of the chairman the following communication was placed in the records:

"AUGUST 23, 1917.

"HOWARD E. COFFIN, Esq.,

"*Chairman, Aircraft Production Board,*

"*Washington, D. C.*

"DEAR SIR: The United States Government is about to enter into contracts with the various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

"Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Company, owning both common and preferred stock.

"Under the circumstances I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company. Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

"I am sending copy of this communication to each member of the Aircraft Production Board, also to the Secretary of War.

"Very truly yours,

(Signed) "S. D. WALDON,
"Equipment Division, Signal Corps."

MEETING OF AUGUST 31.

It being announced that a proposed resolution concerning the Packard Co. was in order to be acted upon, Col. Waldon withdrew from the meeting. Col. Leeds acted as chairman in Col. Waldon's absence.

The CHAIRMAN. Which one of you gentlemen can give us information in regard to the inspection of parts? I will ask you first whether the Packard Co. has a system of inspection?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. For finished parts and for materials?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. Has the Government as well a system of inspection.

Mr. LOCKER. They have for the raw material.

The CHAIRMAN. How about the finished parts?

Mr. LOCKER. Not the finished parts in a 100 per cent inspection, but they inspect some dimensions.

The CHAIRMAN. You mean they inspect a part of the material, but not all of it?

Mr. LOCKER. Yes, sir.

The Chairman. In the performance of this work of inspection by your employees, and then by the Government, is there any conflict or interference with efficiency?

Mr. LOCKER. Yes, sir; at times.

The CHAIRMAN. What does that interference consist of?

Mr. TIBBETTS. As far as our patents are concerned.

Senator FRELINGHUYSEN. You refer to this letter to Col. Deeds. Is that the only agreement there is in existence?

Mr. TIBBETTS. It is, as far as I know.

Senator FRELINGHUYSEN. Then, this letter is the agreement with the Packard Co. in reference to the protection of their patents?

Mr. TIBBETTS. It is the only one I know of. And I might add to that, I probably would know of it had there been any others, as I have charge of the patents here.

Senator FRELINGHUYSEN. Is there any official connected with the Packard Co. at the present time holding any position with the Government?

Mr. HILLS. Not that I know of.

Senator FRELINGHUYSEN. Has any official in the Government any interest in the Packard Co. as a stockholder or otherwise?

Mr. JANDRON. There is only one big stockholder that I know of that is connected with the Signal Corps—S. D. Waldon.

Senator FRELINGHUYSEN. Col. Waldon, a member of the Aircraft Production Board?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. He is a stockholder?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. Was he a stockholder at the time this agreement was made?

Mr. JANDRON. Yes, sir; and there was some correspondence passed at that time, and my understanding was that he made certain stipulations with the Secretary of War and the Council of National Defense on account of that fact, that he was a stockholder in the Packard Co. It is quite possible that Col. Vincent owns a few shares in the Packard Co., but only in a small way.

Senator REED. What do you think Col. Waldon owns?

Mr. JANDRON. About 2,000 shares.

Senator REED. At \$100 par value?

Mr. JANDRON. Yes, sir.

Senator REED. Will you produce for the information of the committee a list of stockholders and also any correspondence in relation to the fact that Col. Waldon is an officer in the United States Army and also a member of the board which executed a contract with you?

Mr. JANDRON. Yes, sir.

(Letters referred to are here printed in full, as follows:)

AUGUST 23, 1917.

HOWARD E. COFFIN, Esq.,

Chairman, Aircraft Production Board,

Washington, D. C.

DEAR SIR: The United States Government is about to enter into contracts with various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Co., owning both common and preferred stock.

Under the circumstances, I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company.

Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

I am sending a copy of this communication to each member of the Aircraft Production Board, and also to the Secretary of War.

Very truly yours,

(Signed) S. D. WALDON
Equipment Division—Signal Corps.

MEETING OF AUGUST 27.

As the Packard Co.'s contract was announced for discussion Mr. Waldon withdrew from the meeting. By order of the chairman the following communication was placed in the records:

"AUGUST 23, 1917.

"HOWARD E. COFFIN, Esq.,

"*Chairman, Aircraft Production Board,*

"*Washington, D. C.*

"DEAR SIR: The United States Government is about to enter into contracts with the various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

"Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Company, owning both common and preferred stock.

"Under the circumstances I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company. Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

"I am sending copy of this communication to each member of the Aircraft Production Board, also to the Secretary of War.

"Very truly yours,

(Signed) "S. D. WALDON,
"Equipment Division, Signal Corps."

MEETING OF AUGUST 31.

It being announced that a proposed resolution concerning the Packard Co. was in order to be acted upon, Col. Waldon withdrew from the meeting. Col. Leeds acted as chairman in Col. Waldon's absence.

The CHAIRMAN. Which one of you gentlemen can give us information in regard to the inspection of parts? I will ask you first whether the Packard Co. has a system of inspection?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. For finished parts and for materials?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. Has the Government as well a system of inspection.

Mr. LOCKER. They have for the raw material.

The CHAIRMAN. How about the finished parts?

Mr. LOCKER. Not the finished parts in a 100 per cent inspection, but they inspect some dimensions.

The CHAIRMAN. You mean they inspect a part of the material, but not all of it?

Mr. LOCKER. Yes, sir.

The Chairman. In the performance of this work of inspection by your employees, and then by the Government, is there any conflict or interference with efficiency?

Mr. LOCKER. Yes, sir; at times.

The CHAIRMAN. What does that interference consist of?

Mr. TIBBETTS. As far as our patents are concerned.

Senator FRELINGHUYSEN. You refer to this letter to Col. Deeds. Is that the only agreement there is in existence?

Mr. TIBBETTS. It is, as far as I know.

Senator FRELINGHUYSEN. Then, this letter is the agreement with the Packard Co. in reference to the protection of their patents?

Mr. TIBBETTS. It is the only one I know of. And I might add to that, I probably would know of it had there been any others, as I have charge of the patents here.

Senator FRELINGHUYSEN. Is there any official connected with the Packard Co. at the present time holding any position with the Government?

Mr. HILLS. Not that I know of.

Senator FRELINGHUYSEN. Has any official in the Government any interest in the Packard Co. as a stockholder or otherwise?

Mr. JANDRON. There is only one big stockholder that I know of that is connected with the Signal Corps—S. D. Waldon.

Senator FRELINGHUYSEN. Col. Waldon, a member of the Aircraft Production Board?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. He is a stockholder?

Mr. JANDRON. Yes, sir.

Senator FRELINGHUYSEN. Was he a stockholder at the time this agreement was made?

Mr. JANDRON. Yes, sir; and there was some correspondence passed at that time, and my understanding was that he made certain stipulations with the Secretary of War and the Council of National Defense on account of that fact, that he was a stockholder in the Packard Co. It is quite possible that Col. Vincent owns a few shares in the Packard Co., but only in a small way.

Senator REED. What do you think Col. Waldon owns?

Mr. JANDRON. About 2,000 shares.

Senator REED. At \$100 par value?

Mr. JANDRON. Yes, sir.

Senator REED. Will you produce for the information of the committee a list of stockholders and also any correspondence in relation to the fact that Col. Waldon is an officer in the United States Army and also a member of the board which executed a contract with you?

Mr. JANDRON. Yes, sir.

(Letters referred to are here printed in full, as follows:)

AUGUST 23, 1917.

HOWARD E. COFFIN, Esq.,

Chairman, Aircraft Production Board,

Washington, D. C.

DEAR SIR: The United States Government is about to enter into contracts with various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Co., owning both common and preferred stock.

Under the circumstances, I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company.

Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

I am sending a copy of this communication to each member of the Aircraft Production Board, and also to the Secretary of War.

Very truly yours,

(Signed) S. D. WALDON
Equipment Division—Signal Corps.

MEETING OF AUGUST 27.

As the Packard Co.'s contract was announced for discussion Mr. Waldon withdrew from the meeting. By order of the chairman the following communication was placed in the records:

"AUGUST 23, 1917.

~HOWARD E. COFFIN, Esq.,

"Chairman, Aircraft Production Board,

"Washington, D. C.

"DEAR SIR: The United States Government is about to enter into contracts with the various manufacturers for the construction of aviation motors. On account of its unusual facilities for work of this character, it is probable that the Packard Motor Car Co. will be called upon to do a part of this work.

"Before any arrangement is made with that company I wish to call your attention to the fact that I am a stockholder in the Packard Company, owning both common and preferred stock.

"Under the circumstances I shall, of course, consider myself disqualified to participate in any deliberations or proceedings looking to, or which may result in, any agreement or arrangement between the Government and that company. Not only so, but if any such agreement should be entered into, I desire every member of the board to understand in advance just what my interest is.

"I am sending copy of this communication to each member of the Aircraft Production Board, also to the Secretary of War.

"Very truly yours,

(Signed) "S. D. WALDON,
"Equipment Division, Signal Corps."

MEETING OF AUGUST 31.

It being announced that a proposed resolution concerning the Packard Co. was in order to be acted upon, Col. Waldon withdrew from the meeting. Col. Deeds acted as chairman in Col. Waldon's absence.

The CHAIRMAN. Which one of you gentlemen can give us information in regard to the inspection of parts? I will ask you first whether the Packard Co. has a system of inspection?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. For finished parts and for materials?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. Has the Government as well a system of inspection.

Mr. LOCKER. They have for the raw material.

The CHAIRMAN. How about the finished parts?

Mr. LOCKER. Not the finished parts in a 100 per cent inspection, but they inspect some dimensions.

The CHAIRMAN. You mean they inspect a part of the material, but not all of it?

Mr. LOCKER. Yes, sir.

The Chairman. In the performance of this work of inspection by your employees, and then by the Government, is there any conflict or interference with efficiency?

Mr. LOCKER. Yes, sir; at times.

The CHAIRMAN. What does that interference consist of?

Mr. LOCKER. In a great many cases there is a difference of opinion.

The CHAIRMAN. When those differences of opinion arise whose opinion prevails? Suppose that the opinion of the Packard Co. inspectors differed from the Government inspectors, which one prevails?

Mr. LOCKER. It is generally taken up by the Signal Corps inspector.

The CHAIRMAN. Is he stationed here?

Mr. LOCKER. Yes. If it is our opinion that his opinion is not what it ought to be, we get in touch with the downtown office, either Capt. Moore or Maj. Heaslet, and get their decision.

The CHAIRMAN. There is a general system of Government inspection not confined to the Packard Co., but for all classes of Government work. Is that correct?

Mr. LOCKER. I think there is. I understand that all the inspectors over at Ford's do is to inspect the finished product.

The CHAIRMAN. Then, the inspectors for the Packard plant are under the supervision of one man who is under the main office?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. So; if there is a difference of conclusion between your men and the Government men, the matter is referred to the inspector having charge of all the inspectors at this plant?

Mr. LOCKER. Yes.

The CHAIRMAN. And if his opinion is not conclusive you go to the authorities who are over him?

Mr. LOCKER. Yes, sir.

The CHAIRMAN. That occasions a great deal of delay and trouble.

Mr. LOCKER. It does at times.

The CHAIRMAN. What suggestion have you to make with regard to any possible improvement in that inspection?

Mr. LOCKER. As far as the material inspection is concerned. I mean the rough material, that is the one great problem we have. The Signal Corps specifies a certain material which must be used on the different parts which are made. If that particular stock or what they specify is not available, they sometimes have one or two or three or four other kinds of steel that they will allow us to use, but that has just been put in vogue of late. Before that time, if we wanted to use a certain piece of stock in a certain place, that we knew was just as good and that was tested for strength the same as was specified, we had to get a permit from the Signal Corps.

The CHAIRMAN. Is there much rejection?

Mr. LOCKER. Each bar of stock has to be analyzed and it causes a delay of from 5 to 10 days.

The CHAIRMAN. How can that be avoided, in your opinion?

Mr. LOCKER. In my opinion, of course, it is taking a chance in some cases—we buy material here and we test a certain number of bars of it. Whenever you substitute a piece of material for the Government, they insist that you have each bar analyzed.

The CHAIRMAN. You means each particular bar used?

Mr. LOCKER. Each particular bar we use.

The CHAIRMAN. Instead of analyzing a sample here and there?

Mr. LOCKER. Yes. For instance, on the connecting-rod bolt. That is an essential part. There are 24 used on a motor.

The CHAIRMAN. If I understand your recommendation, a fair sample test is always necessary and is all that would be necessary?

Mr. LOCKER. If a concern has a standard reputation, I do not see any necessity why it should have the inspection from the Government to see whether they are performing the work correctly or not that they do at this time. For instance, if you take a motor out to the testing stand, and the motor is 400 or 420 horsepower and performs its duties after it is tested, why should it be necessary to go through with that unless it is necessary to work on the motor? As I stated before, that would give us a great number of men that you could use for some other purpose.

Senator REED. Please give us a general description of your plant—amount of floor space, amount devoted to production of engines, and amount devoted to the production of other aerial work, the number of employees, the number of males, and the number of females. You can fill this answer in when you get a copy of the testimony.

Mr. LOCKER. Our factory at Detroit occupies 56 acres of land. We have 62 acres of floor space. We employ at present 11,103 persons, of whom 945 are females. Our average pay roll is \$1,250,000 per month. Approximately 5,000 employees are engaged directly or indirectly in aircraft-motor production, and about one-half of our facilities are employed in this work.

Senator REED. Your present shift is nine hours a day?

Mr. LOCKER. We are working in most of our operations 18, and in some of them 24, hours a day.

Senator REED. Then you could not very much increase the capacity of your plant by further extending the hours?

Mr. LOCKER. Not until we get the complete equipment.

(Whereupon, an adjournment was taken until 10 o'clock a. m., June 6, 1918.)

AIRCRAFT PRODUCTION.

THURSDAY, JUNE 6, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON
MILITARY AFFAIRS.
Detroit, Michigan.

The committee met, pursuant to adjournment, at 10 a. m. in the office of the Ford Motor Co., Detroit, Mich., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. W. D. MAYO.

The CHAIRMAN. We are principally concerned with aviation and the production of the Liberty engine, and also the cause of delays and disappointments in the aviation program and what can be done to expedite production.

Mr. MAYO. The only thing we know of your committee is what we have seen in the press.

The CHAIRMAN. The Senate Committee on Military Affairs began a series of inquiries into conditions in the War Department back in last December at the beginning of the session. You doubtless noticed that they found out a great many things were going wrong in the Quartermaster's Department and also in the Ordnance Department. We believe we have been able to effect a great many changes and improvements in consequence of these inquiries. We began to inquire into the conditions in aviation about the 1st of January. At first all the information we received was of a very gratifying nature, but shortly afterwards the bright prospects seemed to wane and later on there were no prospects at all, and one of the results—it is not necessary to go into all the details—has been the determination to inquire as closely as possible into the general details regarding aviation and aircraft production and among many other things, to inquire of the contractors or builders what seems to be the matter and to obtain what information they can give us upon which we might be able to act or secure action with a view of expediting things.

Mr. MAYO. In the aircraft work we are making forgings and cylinders for other companies, as well as complete motors.

Senator FRELINGHUYSEN. 400,000?

Mr. MAYO. I forget the number.

The CHAIRMAN. Is your capacity such that you can meet all requirements for cylinders?

Mr. MAYO. Yes, and a great many more.

Senator REED. How many hours a day are you working?

JOHN R. LEE (secretary to Mr. Henry Ford). Twenty-four. Some departments 16 and some, very few, 8.

Senator REED. On Government work?

Mr. LEE. Sixteen. On all the heating and tempering operations. 24. . We are running some few of the Government operations 24 and the others 16.

STATEMENT OF MR. HENRY FORD.

The CHAIRMAN. What is the extent of your contracts for anything connected with aeroplanes?

Mr. LEE. We have one contract for 400,000 forgings.

Mr. FORD. That is in the raw state.

Mr. LEE. An those we have been delivering right along. We have shipped something like 210,000. We have a capacity in 24 hours of 4,000 of those. At the present time we are running about a thousand because everybody is filled up and waiting for shipping instructions.

The CHAIRMAN. How long would it take you to finish that contract for 400,000?

Mr. LEE. Almost any time we can start at the rate of 4,000 a day and clean that contract up.

The CHAIRMAN. That is, your contract for all cylinders?

Mr. LEE. Yes.

The CHAIRMAN. And you are furnishing them to other plants?

Mr. LEE. Yes.

The CHAIRMAN. Do you know whether you are furnishing all of the raw cylinders to the other manufacturers?

Mr. LEE. All but a few that the J. G. Brill Co. are furnishing. That is the only one out of the seven companies that we are not shipping cylinders to.

The CHAIRMAN. In addition to the cylinders which you furnish in the raw state you are also making motors?

Mr. LEE. We have an order for 5,000.

The CHAIRMAN. You have just started production on those?

Mr. LEE. Yes, sir. You saw the engines running yesterday.

The CHAIRMAN. What will be your capacity when you get under full headway?

Mr. LEE. Our ultimate capacity will be 100 motors in 24 hours. and possibly we can get them in 16 hours.

The CHAIRMAN. How soon can you reach that point?

Mr. LEE. It is pretty hard, right at this moment, to make a forecast.

The CHAIRMAN. How soon can you reach 50?

Mr. LEE. They ought to be doing 50 motors in four or five weeks.

Senator REED. Fifty motors a day?

Mr. LEE. Fifty motors a day.

Senator REED. We went through your plant, and I simply want it to appear in the record—if I do not state it right, I am stating it in order to make it short—as we understand, you had to put in a very large part of the machinery.

Mr. LEE. Practically all of it.

Senator REED. That you are using to make these engines?

Mr. FORD. To machine the work.

Senator REED. And that has been the principal cause of your delay in getting production started? Is that right?

Mr. LEE. Yes; that has been one of the causes. The whole job was brand new, and, of course, everybody went into the machine tool market, which was already filled with orders, to get this equipment, and it took some time to get it, and then there has been the evolution of an intricate piece of mechanism.

Mr. FORD. And too many experts.

Senator REED. What do you mean, Mr. Ford?

Mr. FORD. Too many engineers trying to improve and do things. By the time we got the first cylinder made it was in shape then to go on and duplicate it.

Senator REED. Who were the engineers, Government or private engineers?

Mr. FORD. No; not Government engineers. While I guess they have a grip on some of them now they did not at the start.

Senator REED. Were they men representing the Government?

Mr. FORD. I think so.

Senator REED. I want to know whether these changes were brought about by engineers who simply wanted to see improvement or changes by those who represented the Government?

Mr. FORD. Most of them were brought about by people wanting the glory, to tell the truth about the matter. You know the glory stuff is dangerous stuff and a lot of people are like the moth around the candle. They like to fly around and around it.

Senator REED. How could men merely seeking glory have anything to do with it? How could they interfere with the contracts?

Mr. FORD. We did not do any of the designing.

Senator REED. That is the point.

Mr. FORD. We have done no designing of anything we have made for the Government. We have been willing and ready and have been making everything we could get, but have done no designing. We have designed the method of doing it, but not the article itself. On these cylinders we designed and developed the way of doing it right here in our own shop, but did not design the finished cylinders.

Senator REED. It was pointed out to us yesterday that you had developed the idea in this plant of using a whole steel cylinder to make the cylinder out of.

Mr. FORD. That was developed here, and by the concern that made the tools to do that sort of work, such as upsetters, etc. People who make those tools are always able to suggest how things can be done on their machines and we have been able to do that part of it very quickly and have been able to supply them with all the cylinders they could handle.

Senator REED. To dispose of the engine proposition, you are able to furnish cylinders as fast as they may be required at any time during this war?

Mr. FORD. Oh, yes.

Senator REED. And if you are pushed along you will reach a point where you will increase in a few weeks probably so that you will be able to make 50 motors a day and shortly 100 a day?

Mr. LEE. Yes.

Senator REED. I want to proceed one step further than that. How long would it take you to develop the output of motors so that you could make 200 or 300 a day?

Mr. LEE. We have now made up our minds to drive all expert engineers out of it and make it as it is, and, of course, we will get into production very quickly.

Senator REED. You are aiming at 100 and I am inquiring now if the Government called on you for 200 or 300 a day, how long would it take you to reach that point?

Mr. LEE. To get at that in a different way: It would be almost impossible to go out now and get the equipment of the kind we have to have to increase the capacity of our present equipment so that we could produce 300 a day. Mr. Ford yesterday in discussing this problem said that if the various producers of the Liberty motor could specialize on one, two, or three or more parts, that they had had experience in getting out and other parts could be allotted to the other manufacturers, we could increase the output very materially. You see those big machines go into shops crowded to their utmost now with orders from the Emergency Fleet, and especially with orders from the Ordnance Department, and the difficulty is to get the machines out, but so far we have been very fortunate in all our plans for the manufacture of the cylinders, and in getting four or five other articles, and other people are shy on crank cases, and Mr. Ford thought if that could be done, the output could be immediately jumped.

Mr. FORD. If there was one assembling plant to assemble the motor complete and test it out in the East, and every factory here, ourselves and every other factory, would send inspected parts complete right to that plant, it would compel everybody to standardize because everything would be just alike.

If we were making certain things in a certain way, and another concern was making it just like it, then, over in France when there were repairs to be made, the parts would fit together, but where everybody is trying to make each part a little better we are not likely to get it any better. We have made a million and a half of the little cars, and the way we did it was that everything was made alike and could be sent anywhere.

Senator REED. Mr. Ford, what is your opinion of this Liberty motor?

Mr. FORD. The Liberty motor, in my estimate, of course, is the best article that has ever been gotten up along that line, I am sure. It seems to be made very accurately and carefully and is very good. because the limit of weight per horsepower is very close, less than 2 pounds.

Senator REED. You think the motor itself is all right?

Mr. FORD. From everything I can see. I have not been in on the tests very much on this, but from everything I can see I do not see that there is anything wrong with it.

Senator FRELINGHUYSEN. Do you believe that because of the limit of 2 pounds per horsepower it is pretty delicate and fragile?

Mr. FORD. Yes; but at the same time it can be done.

Senator REED. It is necessary, of course, to cut down weight?

Mr. FORD. Yes.

Senator REED. What about this angle at which the cylinders are set?

Mr. FORD. Of course, I spoke something about that right at the start, but I have a lot of confidence in the engineer that I think was responsible for doing that, and that was Col. Hall, and I do not think there was anything wrong with it, and it worked all right in theory.

The CHAIRMAN. We have heard that you had criticized that feature of the machine, and, of course, we are anxious about it.

Mr. FORD. Yes. Did you hear why it was done that way?

The CHAIRMAN. No. What I mean to say and what I said was that we had heard that you had criticized it.

Mr. FORD. I did criticize it for one thing only. That was because it did not divide up in sixths properly. It is off in the proper division of impulses. It is 45° in place of 60° . I have heard it said that they did that to shut out certain kinds of ignition. I would not want to make that statement.

Mr. LEE. The motor operates for the horsepower splendidly.

Senator REED. The reason assigned, Mr. Ford, by some of the men concerned in the creation of that motor, no matter who they are, was to reduce the head resistance on the engine, and they claim that is the one reason.

Mr. FORD. Yes.

Senator REED. What about the Delco ignition system? Is it, in your opinion, a good system? Is it as good as any?

Mr. FORD. I think it is.

Senator REED. Do you think it is as good as the magneto system?

Mr. FORD. That is the only point. If I had been designing the engine myself I would have designed it so as to take either, regardless of the head, so as to avoid criticism, if nothing else.

Mr. LEE. I have observed some British motors which were ignited by magneto in which it was impossible to run the motor properly with one magneto and they had as many as four magnetos?

Mr. FORD. On a 12 cylinder?

Mr. LEE. Yes.

Mr. FORD. I am only just stating what I have heard.

Senator FRELINGHUYSEN. Suppose it had four magnetos, how much would that increase the weight?

Mr. FORD. I guess it would increase the weight some at that. You now only have a little battery. But, of course, it could be run with two magnetos, I guess, and that still might increase the weight a little.

Senator REED. What can you suggest to us, aside from the matter you have already suggested, which is to have various plants specialize in the production of parts, and then create one great assembling plant? What further suggestions can you make to us in regard to the motor for the aeroplanes?

Mr. FORD. As to changes in this one?

Senator REED. Anything that you think would improve the situation either in the way of producing them or changing the engine, or anything of that sort. We would like to get your suggestions.

Mr. FORD. Of course, if I was doing it I would not have made it twelve cylinders, because it is so much harder to get it into pro-

duction. I would have made it a six cylinder, but, then, you are asking now for a remedy out of this. The remedy out of this, I think, is to standardize, to send them to one place and make just as many as you can of them, and get them ready at all costs, to get the best men possible and get them absolutely right in large quantities.

Mr. LEE. You would be sure to get the standardization feature in such a motor, if you got the parts made by this plan.

Mr. FORD. The reason why you want standardization is because they are going to be taken apart in France and repaired, and you want to be able to pick out any part and have it fit on the plane.

Senator REED. If you were requested to go into production on these motors, on a very much larger scale, could you not successfully accomplish that, Mr. Ford?

Mr. FORD. The way to do it is to get factories all over the country making parts.

Senator REED. That is your idea?

Mr. FORD. Yes, on these machines; to distribute the work.

Senator REED. And by doing that you thing the output could be increased to a point where we would have an abundance of these motors?

Mr. FORD. There is no question but what you could get just as many as you wanted of them.

Senator REED. Have you given any study or consideration to the question of producing the aeroplane itself?

Mr. FORD. I have never given it very much study. Of course, we have a little concern right here in Detroit that has made 2,500 or 3,000 motor-car bodies per day. That is the Fisher concern. And I think those fellows, if they get the drawings, can produce all the planes that anybody can use, just that factory alone, because they are a live bunch of fellows, and then the rest of the firms will be in addition. I know only two of the brothers, but I know what they have done for us and know that they are right on the job every minute. We have a plant in Long Island, a great big plant with 500,000 square feet that we have kept intact because we feel that we might have to get into aeroplane production. We have kept it from being filled as a storage plant.

The CHAIRMAN. Have you used that plant for manufacturing automobiles?

Mr. FORD. Yes, sir. We have had them assembled there. We have 1,000 horsepower or more, and we can get any amount of power there, and there is 500,000 square feet, a big plant.

The CHAIRMAN. That can be converted?

Mr. FORD. Yes.

Senator REED. If you had the drawings now how soon do you think you could convert that into a plant to manufacture aeroplanes and get your force into production?

Mr. FORD. I would want such fellows as that Fisher crowd to take a part in it. They have maybe four or five thousand training planes, and they are just getting into this other.

Senator REED. Regardless of how you would do it; you will decide that in your own way; what we would like to be able to do is to go back to Washington and say that Mr. Ford can, if he is called, do thus and so. We want to get some aeroplanes.

Mr. FORD. If you want to get aeroplanes the way to do, I think, if they have the drawings and designs, is to have somebody who is boss and knows what he is talking about to go around to these places and tell them what to do. I do not know how you can have the head of an aircraft division around New York sitting down there and have him do very much. This is the first time I have said anything about Mr. Ryan, and I do not know anything about him. I think they ought to be on the job, no matter who they are.

Senator REED. Of course, I do not want to press the question unless it is entirely agreeable to you to answer. The question was, what you would give if called upon?

Mr. FORD. All I could say would be we would do all we can. I do not know just what we could do because I do not know much about the conditions of the aeroplane part of it. I know a little about the condition of the motor part of it.

Senator REED. Could you give us some idea to carry back?

Mr. FORD. I do not know just how to answer that.

Senator REED. Let me put it in this way: We are going to send a transcript of these notes back to you and you may look them over if you desire. Suppose if at that time when you look these notes over, if you feel like doing it, if it is not disagreeable to you, won't you give us an idea of what you could do in a reasonable short space of time in the production of aeroplanes?

Mr. FORD. They can be manufactured just as fast as we can ship them, anywhere, if they know what they want. The reason I do not like to talk on that subject is that I have always looked after our own designs on our own work myself, and it is pretty hard to say what I can do when somebody else is looking after the designing and making changes. But if they have got the thing settled, so as to say, "Go ahead," without any changes which will be liable to turn it upside down——

The CHAIRMAN. Changes would make this quantity production practically impossible?

Mr. FORD. Yes, they would, but there must always be somebody to judge whether the change should be made or not. The trouble is that when changes are made when it is just somebody's idea by somebody being a boss that does not know whether they ought to go through or not.

The CHAIRMAN. Experimental instead of practical?

Mr. FORD. Yes.

Senator REED. What about your ability to produce an aeroplane without regard to designing?

Mr. FORD. I do not know. I keep hearing some funny things all the time. We produced some armor plate here lately, and it stands up very well. I do not know whether you have seen it. And I understand now that the German aeroplanes are built to shoot ours down and everybody else's down because they have a better armor plate on their planes, and because they have protected the vital parts better than we or the English have. I have heard that in the last day or two, and the reason I talk that way is that the Germans were getting a supply of the material from the allies that they have used to make this armor plate before 1914, out of this country, and a lot of it. I do not know whether we can get very much of that around here yet or not.

The CHAIRMAN. What alloy have you used in the manufacture of this plate?

Mr. FORD (name of the alloy deleted). That is the principal alloy.

The CHAIRMAN. That name is absolutely strange to my ears. Is that an alloy which we can produce in America?

Mr. FORD. There is some of it in America and a great lot in South America, and the Germans got their supply out of South America. There should not be anything said about that in the newspapers. We have at the present time bought up all we can find anywhere because we are thinking of using it in these little tanks.

The CHAIRMAN. I wish, Mr. Ford, you would give us an answer to that last question, if you will, when we send back these notes to you; what you think you could do in the way of producing aeroplanes.

Mr. FORD. Yes, I will give you an answer on that if you will give me three or four days. I will go to the Fisher Co. and look around and I am going to New York.

Senator NEW. Mr. Lee spoke to me a little while ago of the Brill Co., of Philadelphia, and I presume he meant they were furnishing rough cylinders to the Marmon Co.

Mr. LEE. Yes.

Senator NEW. Was the contract for making those cylinders originally limited to the Brill Co.? Were they the only concern that was set at work making the rough cylinders?

Mr. LEE. I think they were the first concern that the Signal Corps got in contact with when they wanted cylinders, and they had no idea whatever as to what form or what process would best produce the cylinder they were after, and it was thought that there was no other way to start except by having a solid forging and boring it all out and the Brill Co. undertook to make those in that way, and not only was the process slow but the cost was terrific. Simply from hearsay, I think they cost in the neighborhood of \$20, and in desperation they started around the country to find something in larger quantities, faster and stronger than the cylinder made out of the forging that had the heart of it taken out, and they came up here, and by co-operating and getting heavier machinery we were able to get these in preparation, and instead of a cost of \$19.75 we get a stronger cylinder for \$8.

Mr. FORD. It is the method of doing it.

Mr. LEE. In reference to this Brill Co., we gave them a contract to take up their experimental costs and run out a few thousand, and all those are going to one concern so as not to be mixed up in the general process, as they take a different kind of machine to make.

Senator NEW. Mr. Ford, you said in response to the opening question asked by Senator Reed, I think, that you thought one great difficulty which has interfered with production was that there had been too much engineering; too many engineers. In making that reply, did you have reference entirely to technical engineers?

Mr. FORD. Yes, technical engineers.

Senator NEW. I wondered if by that you meant that you thought there had been interference from any quarter?

Mr. FORD. Oh, no.

Senator NEW. Engineering in that sense?

Mr. LEE. The changes in the main have made it a very much better device. Do you not think so, Mr. Ford.

Mr. FORD. Yes, but at the same time the first engine they made ran.

Mr. LEE. I think Mr. Ford means a lot of petty jealousies among the engineering corps. Another thing is that if they had the headquarters of the Signal Corps in Detroit, where all the engines are produced, and all the engines are wanted, instead of in Washington, it would expedite and smooth things.

Senator REED. Do you agree to that?

Mr. FORD. Yes, sir.

Mr. LEE. I think if that had been turned over to some commercial organization and they had been told to go ahead and to make them on their own honor, they could make them much faster.

Senator REED. Has there been delay through inspection and reinspection?

Mr. LEE. I do not think there has been anything of that kind. Some fellows throw out for little defects, but we have not had a bit of difficulty. The Navy and Signal Corps are fine, and their personnel is wonderful.

The CHAIRMAN. Do they conflict?

Mr. LEE. No; not at all.

Mr. FORD. It is the petty jealousy and the civilian desire for glory.

Senator FRELINGHUYSEN. The chief reliance in America at the present time is on the Liberty motor. In fact, if the Liberty engine broke down we would be over a year behind in our aeroplane production. It will take nearly that time to perfect a new engine.

Mr. FORD. Those engines are out and running. Is there any criticism of the engines which have been delivered?

Senator FRELINGHUYSEN. Yes. I want to lead up to that. The Navy are using this engine in their heavy boat planes to a great extent, and they have no difficulty with the radiation because they have plenty of room and weight carrying capacity, but if the engine is fragile or delicate it might result in a breakdown which would be very expensive. England is taking 3,000 of these engines to put in a super Handley-Paige to counteract the German strength in heavy bombing planes. France has ordered 3,000 of those engines. We are taking large quantities for the Army and for the Navy. Now, if there is a breakdown in that engine, which is manufactured in large quantities, 21,000, I believe, is the present quantity for the United States Government, the situation is going to be very, very serious. I feel, and I believe the committee feels that if there is anything wrong in the construction of that engine it ought to be found out and corrected before a great number are shipped abroad or to the various airplane factories. A defect has been found which seems very serious, and that is the radiation. In trying to fit this motor to the Bristol fighter it is found that the motor heats up very quickly, and they have been compelled to enlarge the area of radiation, in fact, they are building two wings on each side of the plane on each side of the fuselage, which decreases the speed of the plane. Other criticisms have been made. An engineer, who I understand has a very good reputation, Mr. Cammen, has criticized the engine as far as its radiation is concerned, in its construction, and those criticisms

are of a technical nature. They are included in a letter to Senator Brandegee. We have handed that letter to the officers and engineers of the Packard Co. asking them to reply. I am going to send that to you so that you may look it over and make any comments on it you may desire.

There is in New York an aeronautical society composed of men who have studied aerodynamics. They criticize other parts of the engine. For instance, the way this cap is attached to the lower part of the engine, the sump drainage plug. They say that it should be attached by a nut and bolt, that the Mason jar contrivance has not strength enough to stand the vibration of the engine. The vibration is attacked. Those criticisms are specific, and I hope that we will be able to send those to you so that you may tell us about it.

Mr. FORD. I am going into the whole thing within the next 10 days.

Senator FRELINGHUYSEN. Unless this engine is corrected and made proper quickly to meet our needs, it is going to be very serious indeed.

Senator REED. Let me ask this further question. You have only an order now for the 400,000 cylinders which it seems you are pretty well up on and have really slowed down production, and there is no necessity for going faster, and you have an order for 5,000 engines, and if you get up to 100 a day you will pretty soon have that order fairly well wiped out. Is it not necessary, if you are to keep on in production, that you should soon have additional orders in order that there will be no gap in the work?

Mr. FORD. We never pay any attention to the orders here.

The CHAIRMAN. Do you have plenty of materials also?

Mr. FORD. Oh, yes.

Mr. LEE. That is where the delay will come unless we do have orders pretty quick.

Mr. FORD. If the aeroplane is the most necessary thing in the whole thing, we will get the materials.

Senator REED. You spoke in a rather indefinite way about armor plate on the planes. Have you studied that question?

Mr. FORD. Not a particle; no more than just to hear them. We are making armor plate of the same kind they are using in Germany.

Senator REED. When we send back this transcript will you not give up your idea about the practicability of building and making this armor plate?

We do not ask you to answer that at this moment, because it is a matter you will want to consider. If the rest of the committee are through, I want to leave that question and ask you about the building of these ships.

Mr. FORD. The little ships here?

Senator REED. Yes; we have been out and looked at the plant which you built in such a wonderfully short space of time. You have on order for 100 of those ships, which are getting along, we think, very fast.

Mr. FORD. We soon will be, but we thought we ought to at least test one out before going ahead further. You noticed we are getting ready to build the engines. We just made a test on an engine all the way through.

Senator REED. When will you be ready to test the first boat?

Mr. FORD. We will test one in August anyway, thoroughly test it.

Senator REED. Then you will be ready to produce those ships, assuming that the test works out satisfactorily; you will be able to produce those "Eagles" how fast?

Mr. FORD. One a day, anyway.

Mr. FORD, jr. I think the order calls for August, and we are up to schedule.

Senator REED. I want to ask you about the practicability of building at Detroit or some other place large numbers of ocean-going vessels, and what your suggestion might be on that. I mean ocean-going freighters. I mean vessels that can be used as transports and for carrying freight?

Mr. FORD. Do you mean the strategy of it or the possibility of doing it at the present time?

Senator REED. The possibility of doing it, because I was thinking, as I looked at it, and I think the rest of the members of this committee did, that unless we could vastly increase our tonnage and get it quickly, we can not get the necessary number of men to Europe that we ought to get there, and provision them and supply them; that there must be an enormous increase in our shipping; and having looked at your plant out here, that you built in ninety days, I understand, we would like to get your suggestions about what can be done about building some ships.

Mr. FORD. Of course, all there is to it is for somebody to say, "Go ahead," and we can do almost anything. We can do almost anything you can imagine.

The CHAIRMAN. Concretely, following Senator Reed's question up, suppose that the emergency confronted us to-morrow, and the necessity of providing at once for a very material increase in our ocean tonnage, and you were asked to devise ways and means for its production as soon as possible, can you give us an estimate of about how long it would take you to begin the work of production?

Mr. FORD. I have never given it much thought.

The CHAIRMAN. It may become a very urgent problem in the near future.

Mr. FORD. You know there are a great many other things to do. You have to have a canal. They can only run a 166-foot boat through here to the ocean.

Senator REED. Of course, you have not time to build a canal.

Mr. FORD. Of course, the Canadian locks were supposed to be almost through. I think they should be pushed through. The river was not as the shipyard, and we had to bring it up.

Senator REED. Just let us state the problem two ways, pursuing Senator Thomas's question. Let us assume that the locks could be finished up. What can you do here if the locks are not finished up. What could you do some place on the coast, or on a river which is sufficiently large?

Mr. FORD. Well, as I said before, we can do almost anything if we can get after it properly. I don't know just what to say to that, because I have not given it much thought.

Senator REED. I think it is only fair to ask Mr. Ford to take that under consideration.

Mr. FORD. We had a telegram yesterday for engines for those merchant marine ships. If it is serious, we can do it. We have two

models of engines that we have gotten out for chasers, and we have another model. And this last one will be done in another week or so, and they can be used for merchant ships. They could be used for ships carrying 5,000 or 10,000 passengers.

Senator FRELINGHAUSEN. What ton ship do you think would be the most available size to standardize?

Mr. FORD. I think a 6,000 or 7,000-ton ship would be a good ship. It would be an ocean-goer and a coastwise ship afterwards. A ship 400 feet long.

Senator FRELINGHUYSEN. To be built up to 8,000 tons and standardized?

Mr. FORD. Yes.

The CHAIRMAN. I think the ship they are now building is 8,000 tons.

Senator REED. They are building at Hog Island two classes of ships. One is 75,000 tons and the other 88,000 tons. The latter ship is built to run at much faster speed than the first one, and it costs a great deal more money and power.

There is a difference of opinion, I think, as to which ship is really the best, because the fast ship can escape the submarines better, but the slower ship takes so much less power. What we want to get, as members of the Military Committee, are all the suggestions we can from really practical men who have accomplished things as to how we can get this shipping enormously increased without delay, to get something that will haul men and haul materials; and while you speak of the uses of these vessels after the war I think you can regard that as negligible, because the British claim now that we have to get a lot of troops over there quickly, or else pay for the delay. I do not know of anything else to bother Mr. Ford with, except he might tell us about these tanks.

The CHAIRMAN. I am enormously interested in that armor plate proposition.

(Whereupon, the committee took a recess in order to view a moving picture of the Ford tank.)

After making an inspection of the plant of the Ford Motor Co., the committee met in the office of Cadillac Motor Car Co., Detroit, Mich.

STATEMENT OF MR. R. H. COLLINS.

The CHAIRMAN. Mr. Collins, what position do you occupy with the Cadillac Motor Car Co.

Mr. COLLINS. I am president and general manager of the company.

Senator REED. Please tell us about your plant here. Tell us when it was built and what your capacity is, etc.

Mr. COLLINS. This plant was built, Senator, a year ago, to take care of a contemplated English aeroplane engine contract, and something turned out wrong with the motor and the contract did not materialize, and in the meantime we had built the plant.

Senator REED. What motor was that?

Mr. COLLINS. I do not remember the name.

The CHAIRMAN. It was a plane and not a motor, was it not?

Mr. COLLINS. No, a motor.

The CHAIRMAN. An English motor?

Mr. COLLINS. Yes, sir. The plant stood idle until last December, and on the 14th of December a contract was made by the General Motors Corporation with the Government for 1,000 Liberty motors. That contract was increased later by a thousand more, so we have now a contract for 2,000 Liberty engines. The schedule provided for 25 in May, 125 in June, 250 in August, 300 in September, I think, at any rate, it runs out in November. To equalize production under this contract, it is 20 motors a day. When this contract was taken, it was suggested, in fact, made a part of the contract, that we were to clean up and get ready for 15 motors a day as soon as possible. This contract with the General Motors Co., which has control of the Buick, Cadillac, and several other motor car companies—there was about half of the work being done at this factory and half at the Buick factory at Flint, Mich. There is only one duplication. In fact, there are two. They are assembling motors and testing them and not making cam shafts, and we are making cam shafts. We have gone along with the expectation of taking care of this contract schedule and bringing this capacity up to 15 jobs a day, and on many parts of the motor we are up to 15 jobs now.

The CHAIRMAN. When you say 50 jobs, you mean 50 engines.

Mr. COLLINS. Yes, sir. There are many other parts of the motor that we are away below on, and in spite of everything we can do it will be weeks before we could get up to 50 a day, but not only that, but a question now, since I have learned more about the Liberty motor than a few months ago, whether or not 50 jobs a day of the full list of parts can be produced in this factory. When we started in on this job we consulted machine makers, tool makers, etc. They came along and said that to bore 600 cylinders a day—that is what it takes for 50 jobs—it would require 18 to 20 Reed-Prentiss boring machines. When we came to get into the shop and found the operations away up into 40 machine operations, everybody found out that we were away short of machines, so we increased our Reed-Prentiss boring machines up to 28, and we have since ordered 18 Stizele boring machines. Then the question of tools has kept us all slowed up here, the tooling of all these machines, but we think that by the 10th of August we could be doing on all the work 30 jobs a day, which is 10 more than our contract calls for, and I think the capacity of this Detroit factory here is about 30 jobs a day. I think that is the peak.

The CHAIRMAN. What about your Flint factory? Do you count that in with the thirty?

Mr. COLLINS. Yes, sir.

The CHAIRMAN. That is, it takes the Flint and Detroit factories to turn out thirty?

Mr. COLLINS. Yes, sir.

The CHAIRMAN. You spoke about boring cylinders. Do you mean you take the cylinder which is first furnished by Ford in the rough, out and finish them into cylinders.

Mr. COLLINS. I mean to take the Ford forgings, and bore them out and finish the minto cylinders.

The CHAIRMAN. Have you been occasioned any delay by anything the Government has done or failed to do?

Mr. COLLINS. I do not think so, excepting in one thing. I would say that Detroit, generally speaking, is in frightful shape for high-grade labor and machines for tool making, and I believe that demands are going to be made upon us before any great length of time. I believe ways will have to be found to bring high-class tool-makers back to this district.

The CHAIRMAN. Do you think the Government has attracted them away from this work?

Mr. COLLINS. Yes, sir.

The CHAIRMAN. How about the draft, in this case, in the Army?

Mr. COLLINS. Not as much as specific cases I can mention. An officer of the Army would come here and it happened very largely before the draft that while a man could get volunteers, a major or captain would drift in here and would advertise the fact that they wanted so many hundred men for repair-shop work in France, and those men made their headquarters at our factory, and they had a list, very often, of men who were in the factory of draft age, and they would call those men in and say to them, "Will you volunteer for this special work in this department? If you will, we will keep you out of the trenches." and those fellows, every one of them they secured. They never missed a man and they grabbed thousands of those out of this factory and all our factories.

The CHAIRMAN. How many did they get out of your factory?

Mr. COLLINS. I have a list now showing 1,100 men gone out of our factory, but that includes drafted men and volunteers.

The CHAIRMAN. How many were taken in the way you first described, by officers?

Mr. COLLINS. I could not tell you how many; a great many.

The CHAIRMAN. Is there any way you could tell if you had a little time to look it up?

Mr. COLLINS. Yes, I could give you an idea that would be safe to figure on.

The CHAIRMAN. We will send you back the transcript of your evidence taken here for correction, and you can then fill that in. Have you been able to keep up with the schedule which you had arranged with the Government, the production schedule?

Mr. COLLINS. On Liberty motors?

The CHAIRMAN. Yes.

Mr. COLLINS. No, sir.

The CHAIRMAN. How much are you behind?

Mr. COLLINS. We were to have built 25 motors in May, and we probably exceeded this 25 motors, that is, 12½ Buick and 12½ Cadillac, but no deliveries have been made of the Cadillac because, first, we have not been able to run a 50-hour motor, and, second, I think we have been short in inspectors. They are accepting engines down here now.

The CHAIRMAN. You are ready with 25?

Mr. COLLINS. I think we can scare up more for delivery.

Senator FRELINGHUYSEN. Did you say they were accepting engines on other than a 50-hour test?

Mr. COLLINS. I said they were accepting engines now, but we have not made 50-hour tests. Our engines have not stood the test, but they are accepting motors down here now.

Senator FRELINGHUYSEN. That have not stood the test?

Mr. COLLINS. Yes. The arrangement is that out of every 100 motors you are supposed to have one that you are supposed to run on a 50-hour test.

Senator FRELINGHUYSEN. With one selected out of each 100 motors?

Mr. COLLINS. Yes.

Senator FRELINGHUYSEN. And that establishes the standard for the motor?

Mr. COLLINS. Yes.

Senator REED. Do you not have any other tests on the motor?

Mr. COLLINS. Yes.

Senator REED. What other?

Mr. COLLINS. After assembling it gets what is called a manufacturing run, and I think the lowest are 4 hours, and then it is handed over to the Government inspectors and they run it for 4 hours, and it is taken into the shop and absolutely dismantled and absolutely torn down and all parts are washed and cleaned and assembled and put back on this testing stand and run 1 hour and 15 minutes, and then it comes off, is cleaned up, and accepted or rejected by the Government.

Senator REED. Have your motors stood those tests?

Mr. COLLINS. Oh, yes.

Senator REED. The 50-hour is rather a severe test, is it?

Mr. COLLINS. Very.

Senator REED. Now, you say you will get up to 30. When do you expect to get up to the production of 30 machines?

Mr. COLLINS. I believe the combined factories can produce 30 machines in August; that is, the Buick and Cadillac. There will be some parts that the Cadillac can exceed 30 a day on or before August, and I believe the Buick can get up to 30 and 50 jobs a day very much sooner than we can get up to that because our low speed is on cylinders, and I do not see how we can go very much faster than we are going.

Senator REED. That is, in taking the rough cylinders and producing the finished cylinders?

Mr. COLLINS. Yes.

Senator REED. Have you any suggestions to make in the matter of furthering production that have not already been made?

Mr. COLLINS. Senator, I have a lot of suggestions which are just my own idease and conditions perhaps would not permit of applying any one of them. I would like to add, and you can strike it out, if it is of no interest. At first I think this job was started off wrong, because there are so many different factories trying to build complete motors. I almost believe that if the thing was going to go on for a year or two it is not too late yet to improve the situation by taking this Buick factory and letting one factory specialize. Let the Buick make something and the Cadillac make something and then have all those parts assembled. They are trying to produce standard motors. Let all the finished parts go to a great assembling plant and be assembled, and cut out all these frightful delays and then standardize. One inspector will pass almost anything and another will not pass hardly anything. I believe the big problem

in Detroit, and I speak only for Detroit, is labor. I believe that unless this market is relieved for the work that they are now doing, for the work that is brought in here, that this program will necessarily have to have unusual pressure in order to carry it out.

Senator REED. Please tell us what the labor conditions are in Detroit, and whether or not there is liable to be such a shortage of labor as to seriously endanger the contracts being executed by Detroit firms, and what, in your opinion, is necessary to be done in the Detroit labor situation if larger contracts are to be given to the contractors of this city?

Mr. COLLINS. There should be a national labor committee or exchange which would advise the men through the medium of lectures or otherwise as to labor conditions in other parts of the country, and manufacturers should enter into agreements not to bid against each other for labor.

Senator REED. What is your opinion of the Liberty motor?

Mr. COLLINS. I think it is a very fine motor, a splendid motor. I think there are one or two kinks in the Liberty motor that need to be watched every moment, and that is the bearings and the cylinder jacket. I believe the balance is just a plain everyday manufacturing proposition.

Senator REED. Is there any trouble about the water jacket?

Mr. COLLINS. Yes, I think so.

Senator REED. What is the trouble about that?

Mr. COLLINS. There seems to be an unusual breakage. As far as I see it comes from vibration.

Senator REED. What is the cause of that vibration?

Mr. COLLINS. In any motor, of course, running at very high speed there is bound to be more or less vibration, and the metal, of course, goes and comes with the change of the temperature, the heat. The jacket, of course, gets very hot.

Senator REED. Have you had many of them break?

Mr. COLLINS. Quite a number.

Senator REED. What proportion have been breaking here upon test?

Mr. COLLINS. I should say, maybe, 5 per cent.

Senator REED. Do you think the angle of the cylinders has anything to do with the vibration?

Mr. COLLINS. Perhaps something, but it is, in my opinion, an acceptable type of motor.

The CHAIRMAN. Do you think the radiation has anything to do with it?

Mr. COLLINS. Of course, the water radiation must have something to do with it, because that metal being very thin must heat and cool very fast under different conditions.

Senator REED. You spoke of the bearings. What is the matter with the bearings?

Mr. COLLINS. I do not think there is anything the matter with the bearings, excepting I think that more trouble will come from the bearings than any other part of the mechanism. I think that every precaution should be taken in making and fitting bearings to Liberty motors because when a bearing goes out it does almost everything. It might tear the motor all to pieces.

Senator REED. Is there any defect in these bearings?

Mr. COLLIN: No, I think it is largely a case of very close work, unusual care.

Senator REED. But mechanically, are they sound in principle?

Mr. COLLINS. Oh, absolutely.

Senator REED. You simply mean that the tremendous strain that is put on this engine makes it exceedingly necessary to be careful where the strain comes on the bearings?

Mr. COLLINS. Yes, sir.

Senator REED. And that is where the strain comes on every piece of mechanism?

Mr. COLLINS. Yes, sir.

Senator REED. Do you think the engine needs strengthening there; that the parts should be made heavier?

Mr. COLLINS. I would not say so.

Senator FRELINGHUYSEN. Do you think the engine is fragile and delicate?

Mr. COLLIN: No, sir; absolutely no.

The CHAIRMAN. Do you think there is any greater danger to the bearings of the Liberty motor than any other type of motor? Do you think there is greater possibility of breakage?

Mr. COLLINS. Oh, yes, because the arrangement that they get is something away beyond the arrangement that you give a bearing in an ordinary automobile.

The CHAIRMAN. I am talking about other aeroplane motors.

Mr. COLLINS. I am not acquainted with anything else in the way of aeroplane motors.

The CHAIRMAN. Are you producing planes also?

Mr. COLLINS. No, sir. We are producing Liberty motors and a very large gage order for the Government. Micrometer gauges for the Liberty truck.

The CHAIRMAN. I suspected that from your poster.

Mr. COLLINS. We are doing things to just keep up enthusiasm. We are making about 3,000,000 parts for the Fisher Body Co., aeroplane parts.

The CHAIRMAN. Are they made of wood?

Mr. COLLINS. No, metal; screw machine stock and we are heat-treating a great deal of other stuff because we can give them stresses that are satisfactory.

Senator REED. Your first contract was at \$7,700, was it not?

Mr. COLLINS. No, I think it was \$6,200.

Senator REED. I have a memorandum which may be incorrect, that your contract is for 1,000 Liberty motors at \$7,700, and then your contract of March 29, of \$1,600,750.

Mr. COLLINS. No, this contract of March 29, was for seven hundred and some motors, because in the original contract the spare parts came into consideration therein. I believe that the General Motors contract—I believe the original contract was \$5,000 with some bonus proposition. After that discussion of price we had the last contract, as I remember, taken down from \$6,200 to \$5,000.

Senator REED. Have you any other suggestions that you could make now with reference to speeding up production?

Mr. COLLINS. We touched on the Liberty situation. There is a tremendous need of tool-room capacity. I can not tell you how

badly it is needed, but when we started out to find tool-room capacity, we found that practically all the tool-room capacity was on Government work.

Senator REED. When you say "tool-room capacity," you mean capacity to make tools?

Mr. COLLINS. To make tools for these big machines.

Senator REED. And you find that nearly all are on Government work?

Mr. COLLINS. They are filled with Government work, and I don't know when this production gets up to its peak, where the tool-room capacity is going to come from to take care of the big demand for new tools. These machines will require hundreds of tools.

Senator REED. You think that there ought to be constructed by somebody, in some way, great shops in which to make tools?

Mr. COLLINS. That is the idea exactly.

Senator REED. Where are they to get their labor?

Mr. COLLINS. That is leading back to the point that the tool-makers and high-grade labor must be brought back, if this program is to be carried out, or the Detroit labor market must be stimulated in some way.

Senator REED. How would it do to make these tools in some other place than Detroit?

Mr. COLLINS. They are doing that. They are making tools in Cincinnati, Chicago, Boston, Indianapolis, and Detroit. We are making them in any place where we can find any open tool-room capacity.

Senator FRELINGHUYSEN. Do you believe that this breakage in the water jacket of the cylinder is due to the method in which the cylinders are made, making them out of pipes, and then practically drop-forging them?

Mr. COLLINS. No. I was discussing that with some men this morning, and we are building a motor now with six regular cylinders on one side, and six cylinders on the other, which we are going to treat according to our own ideas on the other side, and will test that motor out and see what will happen.

Senator FRELINGHUYSEN. Does Ford make all these forgings for you?

Mr. COLLINS. It is not the forgings, but the water jacket, that goes over.

Senator FRELINGHUYSEN. Does he make the water jacket, too?

Mr. COLLINS. No. The water jacket is made by—I can not recall the concern; but they are located at Marion, Ohio, and those jackets come up here and we weld them around the cylinders. Here is all that Ford makes. This is a cylinder that comes out of the Ford forging.

Senator REED. He makes the headpiece, too, does he not?

Mr. COLLINS. Yes.

Senator FRELINGHUYSEN. Do you have difficulty in getting those in sufficient quantity?

Mr. COLLINS. Oh, no. We have difficulty in getting a sufficient quantity finished.

Senator FRELINGHUYSEN. Could not Ford finish those for you and then you could get them in sufficient quantity?

Mr. COLLINS. No. He is machining them for himself.

Senator FRELINGHUYSEN. He says that he is ahead.

Mr. COLLINS. Yes, but Ford is up on cylinders and out on some other things, so he is swapping cylinders for crank cases, or something else that he is low on, the same as we do. There is splendid cooperation between all these concerns in exchanging parts. For instance, if we have a surplus of some particular part and Lincoln is short or Packard is short, or some other concern is short, why we just give them what we have, and if they have any thing they have a surplus of they give them to us in exchange.

The CHAIRMAN. What do you think about the sump drain plug?

Mr. COLLINS. It does not look extra good to me. I never had my attention called to it before. I would make it safer if I knew how, but I am not an engineer. Some engineer would have to tell you about that.

The CHAIRMAN. What do you think of this Delco ignition system?

Mr. COLLINS. It can not be better. It is an absolutely dependable system, and the most trustworthy system in the world.

The CHAIRMAN. What about the relation of the water jacket to the cylinder?

Mr. COLLINS. We are going to take six of these regular cylinders, under the engineering specifications, etc., and put them on one side of the motor, and then take six cylinders and this water jacket here, after it is all finished and ready to be tested. We are going to turn a blow torch on the top of that jacket and give it a process of annealing and then run this set of regular cylinders against this set of irregular cylinders, and see if we can discover anything.

Senator REED. Please tell us whether you have had any sabotage in your plant, or any other act indicative of I. W. W. activity, and, if so, what steps have been taken to remedy the evil and whether or not anyone has been actively detected in such acts.

Mr. COLLINS. If we are suspicious of a man's attitude toward the Government before we let him get out of our observation we call upon the Department of Justice, and if nothing is done and he goes to work again in another factory we take it up with the Department of Justice, and our protection department is right on his trail.

Senator FRELINGHUYSEN. How many Liberty motors have you produced?

Mr. COLLINS. I think we have approximately 25 motors ready for the Government to accept. There is a tremendous loss in getting these motors by. Making that cylinder and the right kind of bearings are about the only jobs on a motor on which some one must be there every moment.

(Whereupon the subcommittee adjourned and proceeded to the plant of the Lincoln Motor Co., Detroit, Mich.)

The sub-committee met at the plant of the Lincoln Motor Company, Detroit, Mich., June 6, 1918.

STATEMENT OF MR. W. C. LELAND.

Senator REED. We just want to ask a few questions, so we will now record all your views on things.

Mr. LELAND. All right.

Senator REED. What was the business of this Lincoln Company before it went into Government contracting.

Mr. LELAND. There was no Lincoln Co. before that time.

Senator REED. You started for the purpose of taking up Government work?

Mr. LELAND. Yes.

Senator REED. What was the work that you took on.

Mr. LELAND. The building of Liberty motors.

Senator REED. This plant had no organization before that time?

Mr. LELAND. We had none.

Senator REED. You had to organize this factory that we are now sitting in from the ground up?

Mr. LELAND. Yes, sir.

Senator REED. When did you get your first contract?

Mr. LELAND. August 31, 1917.

Senator REED. Had you any building at that time?

Mr. LELAND. The Holden Avenue plant.

Senator REED. Preparatory to doing this work?

Mr. LELAND. Yes.

Senator REED. How large is that plant, approximately?

Mr. LELAND. We purchased that plant to give a capacity of twenty 8-cylinder motors a day. That is about a fifth of the combined capacity. This plant is about four times as large.

Senator REED. This plant we are now sitting in you built from the ground up.

Mr. LELAND. Yes, sir.

Senator REED. You had to acquire all your tools?

Mr. LELAND. Yes.

Senator REED. How much of an investment?

Mr. LELAND. Two million dollars.

Senator REED. In this plant or the combined plants?

Mr. LELAND. Both of them.

Senator REED. You had to purchase and in part create the machinery to make these motors?

Mr. LELAND. That is right.

Senator REED. When did you get your first contract?

Mr. LELAND. August 31, 1917.

Senator REED. How many machines did you get?

Mr. LELAND. An order for 6,000.

Senator REED. At what price?

Mr. LELAND. A cost-plus contract. The estimated cost price was \$6,087.

Senator REED. How did you get at the cost-plus price when you had to build the buildings? Does that go into the cost?

Mr. LELAND. That had nothing to do with the cost.

Senator REED. You got a cost-plus price after the buildings were erected.

Mr. LELAND. Our cost is based on the labor, overhead, and special tools required to build the motors.

Senator REED. How fast were you to deliver these motors and when were you to make deliveries?

Mr. LELAND. The original hope was that we could begin delivering. I think, in November.

The CHAIRMAN. You are now talking about 8 cylinders?

Mr. LELAND. No; 12 cylinders. Five in November, 80 in December, 160 in January, 275 in February, 700 in March, 1,400 in April, 1,900 in May and 1,480 in June.

The CHAIRMAN. What have been your actual deliveries?

Mr. LELAND. We did deliver 15 in March. We built 150 in April, and, I think, 127 in May. Those are building and assembling the parts. We actually shipped 15 in March and built 150 in April, and, I think, 127 in May.

The CHAIRMAN. But you have not shipped the full quantities.

Mr. LELAND. We did not ship as many as in April.

The CHAIRMAN. What were the causes for your failure to keep up with the schedule?

Mr. LELAND. That will take a little time to tell. Shall I just give you my picture of the thing?

The CHAIRMAN. Yes.

Mr. LELAND. I will try to give it to you as fairly as I can. You want to know from our hearts why we went into the business. Father and I were with the Cadillac Co. We conceived when war was declared that it was the duty of every company that had the equipment and facilities to help the Government, to do all they could in helping the Government, along the line where they could give the greatest help. It seemed to us, with our experience and training and the organization we had, that it entitled us to give the greatest help by building aircraft motors. We proposed that to the owners of the Cadillac Co. They took a different view. I might state that that was practically the first time that they had ever done any dictating in regard to policy. Father and I ever since 1904 had had charge of the company and had practically acted as though we owned it. We sold out General Motors in 1909, but continued in the management. We proposed that it would be wise to set aside a portion of the factory for building aircraft motors. Mr. Durand did not favor that view and said that he was not in sympathy and told of the difficulties of doing work for the Government. He said that we were in the automobile business; to keep our feet on the ground and not to be lured away by Government contracts, etc., and made a great deal of the difficulties and complications and problems of going to work on Government contracts. I told him that it seemed to me that regardless of the size of the burden we ought to assume that burden and do all we could. Then he said that he was not in sympathy with this war; that the war could be stopped to-morrow and ought to be stopped to-morrow.

I said, "Mr. Durand, do you not believe that if the war was stopped to-morrow, under any peace terms which would be possible, it would seem to me, that either we or our children would have to fight it over again under much less advantageous conditions than now exist." He said, "I don't know anything about it and don't care about it. I do not want our company to take any part in war work." That is the way we divided. We conceived that in this greatest crisis, as it seemed to us, that the ideals of Americanism weighed more than that. As the months came and went his views and ours differed more and more and we could not pull in the same harness, so we sent in our resignations to the Cadillac Co. and then began to think what could be done toward lending our experience and ability in this emergency.

I hope this will not seem to reflect in any way upon anybody. Our resignation was not announced for some time. When we did announce our resignation a number of people who had been active in the organization came to us and said that it had been their intention to stay with that organization as long as we were there, that they had believed in us and our principles and ideals, but now that we were going to withdraw that they did not feel the same way and they said that they did not know what to do; that if we were going to retire from business they would seek employment elsewhere. They said if we were going to engage in business ourselves they would like to go with us.

We told them that the Cadillac was our baby, that we wanted to see that organization maintained, the standards maintained, but when we found that they were very persistent that they should withdraw if we were not there, and very desirous of going with us if we entered this work, there were a few men that we said we would like to have go with us, but in each instance we planned out an understudy so that there would be support for the standards established by the Cadillac and they would be maintained, and, as we believed, the organization would continue.

I should state that this was a long time subsequent to our sending in our resignations. In the meantime we had made up our minds that there certainly would be a large number of aeroplane motors required, and that we knew how to build high grade work advantageously, and it seemed to us that we were placed where we could help the Government most, and therefore we purchased the plant on Holden avenue, and the Lincoln plant to build motors for the Government if they saw fit to give us a contract. That gives you the story of the organization. The question may be asked, why did we think we could do so well, and why did we fall so far short of our expectations at the time of taking our contracts? When we closed the contract the original expectation was for the original 8-cylinder motors. That is my understanding of why the delay occurred.

As I understood, the Government could not tell very well in the beginning just what sized motor would be required. All the information we were able to get indicated that a combat machine would be a 200-horsepower 8-cylinder motor. Believing that, we made preparations along that line, and it was not until the end of August that we learned that information from the fighting front, as we understood, indicated that they had to have a more powerful motor and a 300-horsepower motor, and our contract was closed for a 300-horsepower 12-cylinder motor. Later on, further information from the fighting front indicated that they wanted more power. The day they decided that they wanted more power an effort was made in this country to give them that increased power. My belief is that starting on that day the method pursued to give them increased power did produce that increased power in a shorter time than it could be produced in any way by building a brand new motor. The problem of delay that seems so tremendous when seen in the abstract crystalizes in a definite analysis many of the understandings about the delay.

They had to have increased power and those changes to give increased power necessarily affected the tools which had been made and were being made, and retarded production very materially.

Senator REED. What were those changes, briefly?

Mr. LELAND. Of course, the first change was from the 8 to the 12 cylinder and that was made just at the time our contract was closed, and so that cannot be counted, except that we thought we had good judgment. We tried to get a running start in expectation of the contract and got caught.

The next change had to do with the heavier—the changes to make more power were three. One was increasing the compression of the motor to give a bigger kick every time it kicked. The second was to raise the lip of the valves, which made a rather far reaching change in the cam shaft. That affected a great many tools but it was essential to getting more power, lifting the valve higher to let more explosive mixture in to get more power. That necessitated changing the intake header to let more of the mixture come into the intake to go through the wider open valve. Those gave more power, but the effort had been made to design the lightest motor that could be made to give the power required, and, in my judgment, extreme skill was shown in that design; in getting a wonderfully light motor to give the power supposed to be required, and when they asked for more power and the parts had been designed for that power, some of those parts must necessarily be increased in strength. The first part to be increased was the crank shaft, and the crank shaft was made heavier. It was first changed to one size, and then, two weeks later made heavier, and forced feed lubrication was decided on, all of which were desirable things to do to meet requirements, but far reaching in effect upon production.

Then came changes on connecting rods——

Senator REED. They were made heavier?

Mr. LELAND. They were made heavier, and the bearings were made heavier—that is, the walls of the bearings were made thicker—and the backing made thicker to withstand the heavier blow. That change was far-reaching, and that made us change 165 gigs and fixtures, and they were difficult things to change, because all over the country at that time the tool shops had become very busy, and it was very difficult to get that amount of work changed as quickly as they should be changed.

Senator REED. Can you give me those dates?

Mr. LELAND. The final change on the crank shaft and the pressure feed was on December 31. Another thing I did not cover: It took a great deal longer to get those fixtures made than we anticipated, for these reasons: At that time all the tool shops were very busy, and, secondly, a large number of experienced tool makers had been drafted or had gone into the service, and the men left to make the tools were inexperienced, and, unfortunately, in a great many cases, we believe they were held up by undermining methods because of lack of full sympathy with the American program.

Senator REED. Held up by whom?

Mr. LELAND. By workmen in the different tool-making establishments. The chief method seemed to be to make the tool wrong. Where a tool had to be made within a thousandth of an inch it would be out seven, eight, or nine thousandths when it came to us. Up to this time we have had almost no jigs or fixtures that we have not had to make over; some slightly and some unreasonably. When we had

the best people make tools for us—and many of them had made tools for years for us—why, they did not make them as we required. We supervised and did everything we could, but when they came they would not be right. They put up the claim that their men were overtired, and that was certainly an answer, and maybe the only answer. But we were working day after day and month after month trying to get everything right, and it seemed to us that many of those mistakes were willful, for it did not seem that a firm that heretofore had been able to make things pretty close to the time limit specified, and within the limits specified, would take three or four times the limit specified, and we have had to build over practically every jig and fixture we have. Some have been simply changed and some have been practically built over entirely. I could tell you tales along that line that would make your heart ache.

In order to overcome that difficulty, because our working forces seemed to be going so slowly, we made almost superhuman efforts to get men, and sent representatives around and advertised, and we got 83 different factories in this country, extending from Maine to Ohio, Iowa, and Illinois, making tools. That has been the big job, the securing of the special tools and fixtures required, and these changes of the crank shafts and connecting rods, and the propeller hub. Those are the things which have made it necessary to make those tools over again after their once being made, and which have caused delay.

We could not foresee the changes coming.

Senator FRELINGHUYSEN. Have you all the tools you need?

Mr. LELAND. We have one shop now, with the complement of tools, fixtures, and jigs required for an output of 50 a day. They have been coming in strongly just the last week. It was only the first of this month that we had been able to do that, and in the next six weeks or two months we will show you results. I will finish with the changes. The propeller hubs were changed, the cam shaft was changed to give a lift, and that was a far-reaching change and difficult to make, and the piston pin was necessarily changed to withstand this increased force. First, they had a taper, and were changed to a straight hole, and the next change was a smaller hole in the piston pin, and the next change was the quality of steel of which the thing was made, and the steel with which they experimented to try to handle that increased pull was pretty treacherous to handle. It had to be heat-treated within very narrow ranges of limit in order to get the results required. If out a few degrees it would not come right, and that gave us an amount of misery and trouble. We have a steel now that has a wider range and is adequate for the purpose, and is giving much better results.

Senator REED. There were a great many minor changes, were there not?

Mr. LELAND. Yes. I am just mentioning vital changes which affected hundreds of other operations and parts.

The CHAIRMAN. The change in the quality of steel would affect everything?

Mr. LELAND. No; it was simply to give it strength for that particular purpose. What we are trying for in this matter is to get the maximum strength for the minimum of weight, and, therefore, carrying heat-treating to an extreme. You heat the steel up to a certain

point and do some work on it, and it is sometimes heated three times, and each one of those heatings tends to blend the molecules of steel so that a piece of a given weight is a great deal stronger than if not heat-treated, and all that takes a little experimenting to work out for the particular duty required. You get it heated in this way to stand one kind of a blow and another way for another kind of blow. That requires all the theoretical knowledge you have. There have been a great many minor changes, but those are always incidental to manufacturing in quantity and they come out anyway when you are manufacturing in quantities. I do not know of any manufacturer, taking the most successful ones, who does not make a great many changes in order to begin to manufacture in large quantities. The records of the Cadillac Co. and other manufacturers will show that when a new motor is put in production the workmen and the foremen, practical men, see ways for improvement, and they suggest the changes, and, as far as those changes are concerned, our belief is that they have not exceeded, if they have equaled, the ordinary number of changes which an ordinary motor would have in getting into production, but these vital changes have had to be coped with.

The CHAIRMAN. What can you tell us about your production program for the future?

Mr. LELAND. May I preface that with one statement? We gave a schedule when these changes came that we hoped to be able to live up to, but at the time of giving that schedule we based it on receiving these special tools that would be necessary for the changes at the dates promised, and said, "If those tools do not come in on the dates promised, or if they are not ready when they come in, we will have to build them over and will have to postpone the schedule by just as much as those tools delay us in delivery or on account of correction." We now have tools for 50 motors a day. They are just here and we are putting them into operation. We believe that during this month of June we will deliver you 500 motors. If we can do any better we are going to do it.

The CHAIRMAN. Five hundred during the month of June?

Mr. LELAND. Five hundred during the month of June.

Senator FRELINGHUYSEN. How many have you delivered up to this time?

Mr. LELAND. Up to June 1 we have shipped 236 motors.

Senator REED. You were going to give us the program you expected to carry out. You say 500 in June, you think you will send?

Mr. LELAND. Five hundred in June.

Senator REED. Then, what after that?

Mr. LELAND. The difficulty there is the same one we had before with the rest of the tools. The plans of the tools have not come in yet.

Senator REED. If you do not get any more tools you can still keep on making them, 500 a month, can you not?

Mr. LELAND. You are right. I believe that it would be conservative to say 1,000 in July.

Senator REED. What in August?

Mr. LELAND. To be conservative, I should say 1,500 in August, and 1,500 a month until the contract is completed.

Senator REED. And your contract is for how many?

Mr. LELAND. Six thousand. September and October will finish it up.

Senator REED. What are you going to do then?

Mr. LELAND. We shall be very glad for another order then. We think we can show such results before that that we can follow along with another order or contract until the war ends.

Senator REED. Is it not necessary that you should know within the very near future what extra work or new work you should have in order that you may have the raw materials and organization and machinery in preparedness for it?

Mr. LELAND. It is very vital to know that, yes, sir; and the deliveries will be wonderfully enhanced by that knowledge.

Senator REED. You need that knowledge right away?

Mr. LELAND. We ought to have it within a month. By the end of this month we will be on our production schedule and the whole plant will be in the progressive work of manufacturing, and we will be able to lay a schedule worth while.

Senator REED. All right. We have necessarily to be very brief, because we are going away. I want to ask you what your judgment as to the capability, reliability, etc., of the Liberty motor in its application to flying?

Mr. LELAND. My belief is that the Liberty motor is an excellent motor. We do not know of any better. We realize that we are trying to take a tremendous amount of power out of an unusually small amount of weight. Whenever you do that you are nearer the breaking point than when you have ample strength. Our judgment is that the work the motor has to do to lift planes and fighting under the conditions that exist, that it is as well adapted for that purpose, if not better, than any other motor we know of.

Senator REED. What do you think about the 45° angle at which the cylinders are put?

Mr. LELAND. We think that is absolutely right. It prevents vibration. It is the most desirable angle for a 12-cylinder motor, we believe.

Senator REED. You think it is better than a 60° angle for a 12-cylinder engine?

Mr. LELAND. Yes.

Senator REED. You produced on the Cadillac an 8-cylinder, but never a 12-cylinder.

Mr. LELAND. Never.

Senator REED. Do you know of any other motor that has its cylinders set at an angle of less than 60°?

Mr. LELAND. I do not know the names, but I believe there are such.

Senator REED. In your opinion, is there any danger or unusual or improper vibration in this motor?

Mr. LELAND. We think not.

Senator REED. There has been a question raised here of the ignition system. What is the best ignition, in your opinion, to use in this motor? I mean upon this motor, and I am barring from that question the question of any ignition system being unavailable because of the angle of the cylinders?

Mr. LELAND. My belief on that is very pronounced, that the type of ignition which is being used, which is the Delco ignition system, is the best ignition system that we know of for this high-speed multiple-cylinder work. We base that on our experience with the Cadillac Co.

Senator REED. How long did you use the Delco system on the Cadillac?

Mr. LELAND. Since 1911 or 1912.

Senator REED. What is the reason a magneto is not preferable to the Delco system?

Mr. LELAND. Our experience along that line; all our experience with magnetos goes to show that the owners of cars with magnetos have much more trouble with them than the owners of cars with the Delco system.

Senator REED. What do you have to say about the claim that this Delco system will not work at great altitudes?

Mr. LELAND. We have no knowledge that it does not.

Senator REED. Are you a theoretical or practical engineer or both, or neither?

Mr. LELAND. I will claim to be neither.

Senator REED. You are a very experienced manufacturer?

Mr. LELAND. My experience has been along the line of manufacturing. I had a good foundation course in manufacturing.

Senator REED. Have you had any trouble about breakdowns in your machines when you have tested them?

Mr. LELAND. Do you mean have we had any machine break?

Senator REED. Yes.

Mr. LELAND. We have had some.

Senator REED. Where did they break?

Mr. LELAND. The only breakdowns that I know of came before the connecting rod was strengthened. The trouble was with the bearings, with the great power. The connecting rod bearings were not strong enough to stand that hammering, and it hammered the babbit out and thereby caused a fault, and caused the connecting rod to break.

Senator REED. Did you have any trouble with the water jackets?

Mr. LELAND. None whatever.

Senator REED. And the only breaks came in the connecting rod, and that was corrected?

Mr. LELAND. Yes, sir. We had one other break. A barrel was thrown in when the motors were being tested. We had our guards there, and one morning the propeller smashed all to pieces and a ring of a barrel came from somewhere. Carpenters were working on the roof at the time. Whether it was willful or otherwise, somebody rolled a barrel in.

Senator REED. It might easily have been an accident.

Mr. LELAND. It surely was an accident. It had nothing to do with the motor itself, absolutely.

Mr. WILLIAMS. Did we not have some trouble with piston pins?

Mr. LELAND. Yes, sir. We told you about these changes in the piston pins for greater strength. The reason why the hole was changed, the last time, to secure larger holes, was because the pin would not stand the blow.

Senator REED. Have you had any trouble with your employees; that is, trouble that would seem to indicate that there was anything in the nature of sabotage or willful destruction among your own employees?

Mr. LELAND. Yes; in a very quiet way. We have been watching it carefully and have eliminated a large number of employees after getting the evidence.

Senator REED. What was the nature of this sabotage?

Mr. LELAND. The last thing that came to my attention was in regard to our fire extinguishers. One day we discovered in the little nozzle somebody had slipped up a lump of little fine waste in such a way that when you turned the fire extinguisher over to use it it would drive this waste down in the hole and prevent any action in case of fire; and we found 36 in that condition. We immediately went around and corrected every one of those, and the next day we went and reinspected them, and found 14 had been redoctored in the same way.

Senator FRELINGHUYSEN. How long ago was that?

Mr. LELAND. Three or four weeks ago.

Senator REED. Did you catch anybody?

Mr. LELAND. Not yet.

Senator REED. I think you ought to have caught that fellow when he put those plugs in the last time.

Mr. LELAND. I think so, too. We are strengthening our guard posts. We laid this before the Department of Justice and the Plant Protection Department, and are getting all the help we can.

Senator REED. When did you discover this?

Mr. LELAND. Three or four weeks ago.

Senator REED. Was that the first occurrence of that kind?

Mr. LELAND. Of that particular thing.

Senator REED. I mean where there had been an evident purpose to injure or destroy.

Mr. LELAND. There have been many, many cases. This was two or three months ago. Here is an engine on the assembling stand. Our system is so arranged that we can bolt the engine and swing the stand around and work on the side to save time. This engine is bolted to the stand with four bolts, and is securely fastened, and a man was working on it at night, and had been working on the inside, and he turned it and the four bolts were there at night, and he came back here in the morning and just happened to notice that two of the bolts had been taken out. Had he turned it back, as was natural, the thing would have fallen down on the ground and broken the motor.

Senator REED. Have you detected who did that?

Mr. LELAND. Not yet. In another department we had this kind of trouble. The machine would be working all right at night, and the next day they would find an adjustment had been changed. In one department seven adjustments had been changed, so that seven of the boys spoiled their work on those. Somebody stayed late and did things like that. We followed up these cases and found the man and discharged the man that we believe did it and have not had any trouble in that department since.

Senator REED. Was he an American or a foreigner?

Mr. LELAND. A foreigner, a German.

Senator REED. How many Germans have you got in your plant?

Mr. LELAND. I do not know as I can tell, but a lot less than we had once.

Senator REED. Do you or not think it is wise to keep any of them?

Mr. LELAND. I believe that some of them are very loyal. It seems to me that the evidence is unmistakable. Some men seem to be lifting like little giants. They are getting results and seem to be as loyal as any Americans, and the way they respond to any emergency seems to prove that they are all right. At one time we had to dismiss eight Germans.

Senator REED. What was the occasion for that?

Mr. LELAND. The story was like this: It was along the line of holding up tool work, the same thing we experienced with outside plants. We would find that tools that we needed very much would be a long while in coming from the tool making department. We had a highly recommended man in that department who was very agreeable, and we became very suspicious when we tried to question him. He made very evasive answers. One set of six tools he swore were not in his department, and we asked him to make a thorough search and he did not find them, and we made an independent search and did find them. Either he was inefficient or a rascal. He was skillful enough to make the man in charge of our production department believe that he was one of the most efficient and loyal men they had. He would make them think he was very efficient, but the usual run of work would be two or three days overdue. They would press him for tools which were to be hardened, and he had as an assistant a clerk, a German who could not talk very plain English, who succeeded in getting those records very badly confused and we rounded him up together with all the others, and at one time eliminated eight men, and the next day after we turned off this foreman and clerk, the American flag was put up by the employees in that department and we have had better results in that department since and we are watching that kind of a situation.

The CHAIRMAN. You have not caught a man in the act of doing anything that was out of the way?

Mr. LELAND. Not actually doing the act; but we caught the results, and did not have to catch these eight men. We did not actually see the men doing any one of those things.

The CHAIRMAN. In other words, the things that they did were of that character that might be ascribed to blunders and sins of omission and it would be harder to prove that than a positive act.

Mr. LELAND. That seems to be the method they pursue all the way through.

The CHAIRMAN. What is the number of your employees?

Mr. LELAND. About 3,600.

The CHAIRMAN. About what proportion are women?

Mr. LELAND. About 400.

The CHAIRMAN. Are you increasing that number?

Mr. LELAND. Yes.

The CHAIRMAN. Are they doing well?

Mr. LELAND. Very well.

The CHAIRMAN. Do they get the same pay?

Mr. LELAND. They get nine-tenths of the pay of the men. As it stands now the reason is this, that they seem to require more supervision. We have to have men to help carry the loads. It costs something more to supply additional help in moving trucks around and they usually lose one or two days a month, plus the extra work we have to do for them.

The CHAIRMAN. You think you pay the same for the same results?

Mr. LELAND. Yes.

The CHAIRMAN. There is a sump drain plug in this machine. What about that plug? It is claimed that it is an unsafe piece of production.

Mr. LELAND. I think that could be improved.

Senator REED. When this record is returned to you please give us the opinion of three or four of your best mechanics as to the safety of the fastening of the sump drain plug and what ought to be done with it to rectify the difficulty, if any there be, and the question is further suggested whether it should not be fastened by a screw.

The CHAIRMAN. The mode of fastening is the subject of criticism?

Mr. LELAND. Yes.

Senator REED. Have you any suggestion to make looking to the furtherance of the engine making or of the aeroplane program?

Mr. LELAND. Do you mean to increase deliveries?

Senator REED. I do not mean just to increase deliveries. You are a practical manufacturer of many years' experience. You have now had some months' active experience in making these motors and are familiar to a greater or less extent with what other manufacturers are doing, and have a general glimpse of the whole airplane program. This committee is desirous of knowing what can be done to give up not only engine, but airplanes, to put them in in quantity, and, if possible, to improve either the engine or the airplane. You need not answer that question now, but you can answer it when we send you a copy of this report.

Mr. LELAND. All right. I will be very glad to send you suggestions.

Senator FRELINGHUYSEN. In connection with your discovery of these acts, is there any system in vogue in Detroit to blacklist any employees to prevent their reemployment in such work?

Mr. LELAND. I can not tell you the details of the working of that system. Of course, blacklisting is very dangerous work. We do try, when we find a man has been holding up the plant, to notify the other plants of our experience. We do not blacklist them. If they are hired they keep watch on them.

Mr. WILLIAMS. I might say that after investigating what seemed to us to be several different cases of very gross inefficiency or sabotage and apparant sabotage we let out eight men, several of them being assistant foremen. In one case we had a man who was supposed to be a trouble shooter to help us out whenever there was any trouble, and as far as we could see that man was making a great deal of trouble. Where we were having difficulties, instead of following those cases right through and seeing that the tools were properly repaired, his efforts seemed to be directed along the lines of delay. In one particular case, when we wanted to get a tool by 4 o'clock in the afternoon, he went down with one of our men in the tool department and saw the job started. Instead of inquiring of the man to whom he gave

the job, he went down to that department a couple of hours later and did not return by the same door. We later went down there to find out how the work was progressing and found it was being held up due to the fact that the blue prints had been lost. The blue-prints were lost about the time that the so-called trouble-shooter disappeared.

Senator FRELINGHUYSEN. By a "trouble-shooter," you mean a man that goes and fixes trouble if it is found?

Mr. LELAND. Yes, sir.

Mr. WILLIAMS. About the time to shut down he came to the man who was responsible for the job and says, "How is the job coming along?" The first time he did not go to that man but went down to the department and then he seemed to be much surprised that the job was progressing, and that was possible because someone on the job remembered the dimensions. Later we found the blue prints near the door where this man went out. Later, when we first got our machine tools in here, and we had to get this entire equipment from new manufacturers, manufacturers who had previously sent in machines built to the required limits, sent in machines with the limits varying so far that we could not produce satisfactory work. We took many of those machines right down and checked them all the way through and where the limits specified should be two-thousandths, we found them going as high as ten-thousands. That was a general trouble that we found.

Mr. LELAND. You are asking our convictions about this whole program and to give you any suggestions we can to help. Perhaps I ought to qualify that by stating what we believe has been—I know it is natural when any man or group of men try to do a big job and the thing does not go the way they hope it will go, they criticize, and we can not avoid that. It seems to me that, looking at it from all viewpoints, and knowing the thing from the beginnings, as we do, and seeing the efforts that have been made, it seems to us that the men who are responsible for this program deserve about 90 per cent commendation every time they deserve criticism. We think that they plunged into a tremendous program. It was necessary to get the program going as soon as they could, and we think those men went down there and gave their experience and ability and really they have put across a wonderful program despite the fact that there have not been as many motors delivered now as that schedule I gave you at the beginning indicated we hoped to get delivered.

The reasons those have not been delivered are what we have just told you, but I think the method they pursued of having this Liberty motor designed and standardized and made and produced in large quantities by the manufacturing methods used in this country will give the greatest sinews of war that can be produced in this airplane line and I think we will get a great many more motors by that method than any other method I have known to be suggested.

Senator REED. Why not have had this engine or motor divided into parts and the parts manufactured in different factories, each of them specializing and then having one general assembling plant? What is your idea about that?

Mr. LELAND. It is mighty hard to get a thing going that way. The motor is a complete unit. There are so many problems to be

worked out. That has its merits and that has been done to some extent, and each manufacturer has obtained help elsewhere, but it is impossible to start a big program and have all the wrinkles ironed out in the beginning.

The CHAIRMAN. Is this man, Mr. Durand, still at the head of the Cadillac Co.?

Mr. LELAND. Yes, sir.

The CHAIRMAN. Has he changed his convictions?

Mr. LELAND. He is the president of the General Motors Co.

The CHAIRMAN. Is he the man connected with the Aviation Committee?

Mr. LELAND. Yes, sir.

The CHAIRMAN. When did he change his views?

Mr. LELAND. I do not know. All I know is that they later took contracts for the same things that they said they would not take on a bet.

The CHAIRMAN. Are you confident that those contracts will be carried out effectively, and good work turned out, in view of his views?

Mr. LELAND. I think so. I think he guessed wrong. He was an ambitious man and had plans and the war was upsetting his plans, and therefore he stopped to check himself up. He was not fundamentally disloyal to this country.

The CHAIRMAN. What is the capitalization of this company?

Mr. LELAND. Around \$6,000,000.

Senator NEW. In your estimation, would it not have been a good thing for the gentlemen who had in their charge the production of aeroplanes to have ordered the production of standard motors, such, for instance, as the Rolls-Royce, in use by the English, rather than to have striven for the perfection of the Liberty motor?

Mr. LELAND. First of all, the Liberty motor outclasses the Rolls-Royce in every contest it goes into. It is a better motor to-day than the Rolls-Royce, and, at least, the English experts have that knowledge. Secondly, had we undertaken to build the Rolls-Royce, it would have taken an outlay for tools and equipment and the manufacture would have developed the same necessary changes in methods that we have now. We would not have had increased power. If we tried to get it increased we would have had the same delays as now. Therefore, the course that was pursued has given up to this minute a motor outclassing the Rolls-Royce and we have gotten it as soon as we could have gotten the Rolls-Royce to the same point, and there is the advantage of interchangeability of parts which may be of vital importance as the war progresses.

Senator FRELINGHUYSEN. Have you ever built any other aeroplane engines?

Mr. LELAND. This is the only aeroplane engine we have built.

Senator FRELINGHUYSEN. Have you made a study of them?

Mr. LELAND. Yes, sir.

Senator FRELINGHUYSEN. Have you ever studied the ignition systems of any other aeroplane motors?

Mr. LELAND. Not personally, but we have engineers who have.

Senator FRELINGHUYSEN. All that you say probably would be true, if the Liberty motor is a success, in regard to the Rolls-Royce?

Mr. LELAND. If it is a success; yes.

Senator FRELINGHUYSEN. The Rolls-Royce was a success and was known to be a success. If the Liberty motor fails it would be better to have the Rolls-Royce, would it not?

Mr. LELAND. Yes; if it fails; but it is not going to fail.

Senator NEW. The Rolls-Royce engine has been used in a number of aeroplanes, and so, for instance, has the Hispano-Suiza. To this hour there has not been an aeroplane that has been built with the idea of having the Liberty motor used in it.

Mr. LELAND. You will have to back down on that.

Senator NEW. No; I will not.

Mr. LELAND. Have you seen the Liberty motor out at the Packard plant?

Senator NEW. Yes; but it is not an accepted motor. I am talking now of the planes in active use. I know that there is such a plane at the Packard plant, and I know there are others that are in process of development, but I am talking of what is actually in practical use on the battle front in Europe. There has been no machine that has been built with the idea of having the Liberty motor used in it.

Mr. LELAND. But there are planes in which the Liberty motor is giving wonderfully efficient service, are there not?

Senator NEW. There are planes in which the Liberty motor gives a degree of success.

Mr. LELAND. If we are not ahead in the contest.

Senator NEW. I think that we would be if we perfected a successful motor. There is no question about that, just as I think we should be congratulated if we start in the production of anything to-day and make a success of it. And it is to-day a fact that we might be defeated a half a dozen times over while we are waiting to develop some new things for the war, rather than having accepted something that is demonstrated a success—some other equipment.

Mr. LELAND. The answer to that is this: It seems to me if we had, as we assumed a little while ago, taken the Rolls-Royce motor and began to manufacture that in this country, and then changed that for increased power, we now would be on an even keel. I am positive, however, we would not have been any further ahead. For instance, if we built a complete set of tools and had stayed with that without change, then we would have a machine less powerful, less flexible, and less efficient than what we have to-day, and having done that first we could not then have started and by this moment arrived at a point where we would have as good a machine as we have to-day.

(Whereupon the subcommittee adjourned and proceeded to the plant of the Fisher Body Corporation.)

(Meeting of the subcommittee in the main office of the Fisher Body Corporation, Detroit, Mich., June 6, 1918.)

STATEMENT OF MR. CHARLES FISHER.

The CHAIRMAN. Mr. Fisher, we have been sent out here by the Committee on Military Affairs to take up the general subject of aviation development with the view of ascertaining, if we can, what has been retarding production and how it can be stimulated. We determined that the best way to do that sort of thing was

and get in contact with the manufacturers who are holding contracts with the Government. I wish you would tell us what your contracts with the Government are and how you are going along with production, what obstacles you have encountered, and who is to blame for them, and how soon you can begin to produce aeroplanes.

Mr. FISHER. Our first contract was for 400 training planes of the standard J type. That contract was completed April 17. Our next contract was for De Haviland nines. They gave us an order for 4,000 of them. We got part of the first drawings on the De Havilands December 23.

The CHAIRMAN. Did you get a model plane?

Mr. FISHER. No; just a little bunch of drawings, probably 5 per cent of the De Haviland Nines.

The CHAIRMAN. Five per cent of the units?

Mr. FISHER. Of the separate parts of the entire plane, a motley mixed lot of stuff that came.

The CHAIRMAN. From whom did you get those?

Mr. FISHER. From the Wright-Dayton Co., of Dayton, Ohio. It dragged along and every week or two we got another little batch of drawings. In January they decided to change the nines to fours, and on January 23 we started to get some of the drawings on the fours, and we have been getting drawings ever since, up to, I should say, about two and a half weeks ago they sent us in a complete De Haviland four which we took in here, and then we got the plans of the dope which we did not have. There is a matter of 50 to 75 different parts or units we have not yet received any information on until this plane came in, this De Haviland.

The CHAIRMAN. When did this plane come in?

Mr. FISHER. About two and a half weeks ago. We never got any drawings on that at all. We had to make those ourselves here.

The CHAIRMAN. Did all the drawings come from the Wright-Dayton?

Mr. FISHER. They started from them but bye and bye switched to the Signal Corps at Dayton.

The CHAIRMAN. Was it possible to go ahead with the construction?

Mr. FISHER. To a certain extent it was. We went as far as we could go; as far as we got the drawings.

The result is now since we have had the plane about two and a half weeks we have gotten the balance of the information and are putting through parts, and have practically one De Haviland 4 of our own make completed so far as we have checked up everything and are in production now.

The CHAIRMAN. Your contract at first called for the manufacture of the De Haviland 9?

Mr. FISHER. Yes.

The CHAIRMAN. You obtained parts of the plans from time to time?

Mr. FISHER. Yes.

The CHAIRMAN. And when you were still incomplete you were shifted over to the De Haviland 4.

Mr. FISHER. Yes.

The CHAIRMAN. And you had the same experience with regard to the plans? They sent the machine, and from that machine you were able, through your own engineers, to complete the plans?

Mr. FISHER. Yes.

The CHAIRMAN. When were you able to complete that set of plans?

Mr. FISHER. Eight days ago we got the last information on the gasoline system. When these supposed complete plans came the gasoline system was not squared away entirely, but everything else was about right and we had almost all the drawings completed, and practically everything is now complete down in the works and ready to get the production going.

The CHAIRMAN. If you had received plans at once with the contract, or thereabouts, how long would it have taken you to begin quantity production?

Mr. FISHER. About four months in nice shape.

The CHAIRMAN. You would have been at this date in quantity production?

Mr. FISHER. We would have had a couple of months to begin production. We would never have had any loss in production. We were shipping about 10 training planes and we intended to go on with the battle-planes, and we have a number of men in our factory who have not been doing anything for two months. We have not shipped anything for two months.

The CHAIRMAN. There has been a gap of some two months in your production because of failure to receive the plans. How many men have you here?

Mr. FISHER. About 800 men. We threw them all out except about 200.

The CHAIRMAN. Did you keep your men or discharge them?

Mr. FISHER. Discharged them.

The CHAIRMAN. That threw out your organization?

Mr. FISHER. It hurt it.

The CHAIRMAN. To what extent will that interfere from now on?

Mr. FISHER. None, because we will draw from our other plants. We have about six or seven thousand people on our staff on other work.

The CHAIRMAN. Who is to blame, in your opinion, for that failure to supply you with the plans necessary for you to perform your contract?

Mr. FISHER. That is a pretty hard question to answer who is to blame. Here is an article to be manufactured which nobody in this country knew anything about. We had the ability to manufacture anything here that can be manufactured anywhere, if you will lay the information down to us with the drawings and specifications.

The CHAIRMAN. What arrangements did you make with the Government to secure a plan from which you could make your own plans?

Mr. FISHER. That if they would give us the plane and lay it down and say, "make it," that is all we wanted. We said in our contract, "we will make deliveries four and one-half months after the receipt of all completed drawings and specifications." If they had given it all to us at one time we would have made deliveries.

The CHAIRMAN. Did you make your contract in Washington?

Mr. FISHER. Yes, sir.

The CHAIRMAN. When you made your contract was assurance given as to when you were to have these plans?

Mr. FISHER. When we made the contract in the first place we were to have all these plans within two weeks, and they expected to give us a plane.

The CHAIRMAN. Who gave you that assurance?

Mr. FISHER. That matter was talked about down there.

The CHAIRMAN. Who?

Mr. FISHER. Cols. Montgomery, Deeds, and Waldon and another gentleman who was in there at that time. Here is what they were going to do. They were going to give us a completed plane. In other words, they thought they had a second De Haviland coming from the other side. They gave that to the Dayton people in August.

The CHAIRMAN. Was that a No. 9?

Mr. FISHER. A No. 4. There was no No. 9 in existence at that time, except a plane in England.

The CHAIRMAN. Then, your contract called for the manufacture of 4,000 De Haviland 9 planes, of which there was only one in existence, which was in Great Britain?

Mr. FISHER. Yes. They found out that they they could not get this plane and told us so.

The CHAIRMAN. Do you know whether the British went ahead with the manufacture of that De Haviland at any time?

Mr. FISHER. I think they have made some of them.

The CHAIRMAN. What reason did they gave you for switching to the De Haviland 4?

Mr. FISHER. They made up their minds that it was impossible to give us the information on the De Haviland 9 and they had to get us started on something. We began to get a little uneasy about it. We knew what it meant to get started, and they made up their minds to build some 4's, and, as a matter of fact, they only gave us a release on 500 to start with. They thought they might overcome the difficulty in getting information on the 9's, but they later saw that they would not get the No. 9 information, so they decided to have us build 2,000 4's.

The CHAIRMAN. The fact is that because of your failure to get a model of the machine or plans for the machine you are not yet in quantity production or ready for it?

Mr. FISHER. No.

The CHAIRMAN. When do you expect to be producing planes?

Mr. FISHER. We are producing planes right now.

The CHAIRMAN. I know, but not in quantity.

Mr. FISHER. We expect to ship some planes this month.

The CHAIRMAN. What quantity production does your contract call for?

Mr. FISHER. We are supposed to finish this contract by November 1, for 2,000 planes.

The CHAIRMAN. That depends on whether your plans are changed or not?

Mr. FISHER. Absolutely.

The CHAIRMAN. Are there many changes in the plans since you have taken the contract?

Mr. FISHER. There have been changes all the time until recently we got a letter that this plane sent in here was to be the one, and not to listen to anybody else.

The CHAIRMAN. When did you get that instruction?

Mr. FISHER. That letter is here.

The CHAIRMAN. Within the last few days?

Mr. FISHER. No, they have had that for some time. We got that letter right after we got this plane, May 19.

The CHAIRMAN. Our information, Mr. Fisher, is that your De Haviland 4 contract called for 4,000 planes?

Mr. FISHER. No, the only contract in existence is a new contract signed up—there has been a second contract signed up and that has been changed to 4's. There is a contract for 4,000 4's in existence, but we have authority to proceed with 2,000 only; that is, 2,000 were released.

The CHAIRMAN. When you say that you expect to have your output completed in November, you refer to the 2,000?

Mr. FISHER. Yes, sir.

The CHAIRMAN. Not the 4,000?

Mr. FISHER. Not the 4,000.

The CHAIRMAN. When do you expect to begin delivery of the De Haviland 4 under this contract?

Mr. FISHER. In about three weeks; maybe a little sooner than that. A week one way or the other.

The CHAIRMAN. Was this De Haviland four designed for the Liberty motor?

Mr. FISHER. Yes, sir.

The CHAIRMAN. In order to adapt it to the Liberty motor has any change been made in the model?

Mr. FISHER. Yes; that is why they could not give us the information; it was because of the changes necessary to be made in the planes in order to use a Liberty motor.

The CHAIRMAN. Who made those changes, the Fisher Body Corporation or the aviation authorities?

Mr. FISHER. The aviation authorities at Dayton, Ohio, made those changes, and then I think it was taken out of their hands by the Signal Corps.

The CHAIRMAN. You have now instructions to go ahead regardless of any further proposed changes?

Mr. FISHER. Yes.

The CHAIRMAN. Have you anything to do with the matter of radiation for these engines?

Mr. FISHER. No. We make almost everything else but the radiator.

The CHAIRMAN. Where do you deliver the planes?

Mr. FISHER. We are to ship the first hundred planes to Mount Clemens, to the Selfridge field, to be flown.

The CHAIRMAN. In Michigan?

Mr. FISHER. In Michigan.

The CHAIRMAN. Do you put the motor in the machine?

Mr. FISHER. Yes, sir. The machine is ready to fly.

The CHAIRMAN. Then you do install the radiation?

Mr. FISHER. Yes; but have nothing to do with the planning of it. That has been held up several times.

The CHAIRMAN. Has it been settled yet?

Mr. FISHER. Yes.

The CHAIRMAN. How has the radiation been placed with reference to the fuselage?

Mr. FISHER. The radiator is in front on this machine.

The CHAIRMAN. You have no wing radiation surface?

Mr. FISHER. No.

The CHAIRMAN. Has any test been made to determine whether the front would give sufficient surface for radiation?

Mr. FISHER. No. The Signal Corps has taken care of that and the present radiators we are getting are keeping the motor cool.

The CHAIRMAN. If it should become necessary to increase the radiation surface, after the test, that would have to be put somewhere?

Mr. FISHER. I think they would make the radiator that much bigger. I think we will have to learn to make radiators in this country as in the old country, out of thin brass tubing. We do not seem to be able to make them in this country like that.

The CHAIRMAN. If the problem of radiation should present itself and you should try to make the radiation tubes longer, that would substantially affect the balance of the machine?

Mr. FISHER. Certainly, it would make the nose heavier.

The CHAIRMAN. And that might cause a change in the entire machine or a readjustment of the entire machine?

Mr. FISHER. If it was too heavy I think it would tip over.

The CHAIRMAN. Do you know whether any tests have been made of the Liberty motor in the De Haviland four?

Mr. FISHER. Yes.

The CHAIRMAN. Have you yourself witnessed any?

Mr. FISHER. I have not.

The CHAIRMAN. Where were they made?

Mr. FISHER. Dayton, Ohio.

The CHAIRMAN. When do they test?

Mr. FISHER. I think they are testing every day.

The CHAIRMAN. Are the tests made in regard to radiation on the nose reported to be satisfactory?

Mr. FISHER. I am not an authority on that information and could not say. We get our information from the Signal Corps saying which radiator is satisfactory. Our information is that the radiation is satisfactory at this time.

The CHAIRMAN. The letter to which you refer is dated May 17. I will read it into the record.

(The letter referred to is here printed in full as follows:)

MEMORANDUM.

1. Lieut. Col. Hall has been charged with the responsibility for all engineering matters in connection with putting the DH-4's and the Bristol Fighters up to a point where they are released by him for quantity production, on the first 250 planes at the Dayton Wright Co., 250 at the Fisher Body Corporation, 50 at the Standard Aircraft Corporation, and 250 Bristol Fighters at the Curtiss Airplane Co. He shall act at the "neck of the bottle" in this work and orders and instructions issued by him on above mentioned matters shall be followed explicitly.

2. These directions are issued due to the fact that the designs of these planes when issued to the Production Engineering Department were not complete and the planes are not tried out and perfected, and also to facilitate prompt execution of any necessary additions or changes for production.

M. W. KELLOGG,

Director of Production.

Senator REED. From that it would appear that the contracts were issued, among other things, because some plans had not been re-

ceived, or the planes tried out and perfected. It would seem so to you, would it not?

Mr. FISHER. There have been 600 or 700 changes made on these different parts of this machine from the time we started.

Senator REED. Were those changes fundamental or merely incidental?

Mr. FISHER. In some cases they necessitated the removal of the parts absolutely and new ones being made, and the tools were discarded.

Senator REED. In what proportion were there changes of that character? Could you furnish us a list of the changes? We will send this transcript back to you gentlemen, to go over and correct. Can you send us a list of the changes which were so material as to require a discarding of the parts and the tools designed for them, and those which were not so material?

Mr. FISHER. We can gather up all that information for you. There was a gentleman here some time ago with this investigating committee that was sent out. At that time I got out a letter giving him information to date. Our main office is six or eight miles from here. This book contains practically all the information you are after. Here is where we got the De Haviland nine blue print changes and received them from Dayton Wright December 17. There were all changes which were made on the De Haviland nine. We were getting more changes than plans.

Senator REED. The difficulty, of course, is that we have not the time to copy these into our record, and we would prefer that you would add them to the statement.

Mr. FISHER. We got the drawings in here on January 24, and on March 22 I wrote a letter for these gentlemen, who were here that there were 392 changes. That was up to March 22.

The CHAIRMAN. When you say that you got the plans on the 23d of January, do you mean that you got your first installment?

Mr. FISHER. That was the first prints we had to work from.

The CHAIRMAN. And then they kept coming in in incomplete parts from that time on until you got the plane, and then you supplied the missing parts yourself from the plane?

Mr. FISHER. That is it.

The CHAIRMAN. And that enabled you to get the complete plans about when?

Mr. FISHER. We would say that we had the complete plans when we got this plane.

The CHAIRMAN. Mr. Fisher, was the De Haviland four, when your contract was made, adaptable in its construction and shape to the Liberty motor?

Mr. FISHER. No; they were in the act of changing it over at that time.

The CHAIRMAN. Mr. Fisher, about when were the plans so changed as to be adaptable to the Liberty motor?

Mr. FISHER. I think that is the thing they have been developing all this time.

The CHAIRMAN. They have been developing?

Mr. FISHER. Yes; that has been the thing to start with that threw off the De Haviland four motor as it originally was. That was the

change to put the Liberty motor in the De Haviland four plane. The De Haviland four plane would not take the Liberty motor.

The CHAIRMAN. What was the motor in the De Haviland 4?

Mr. FISHER. I do not know just what it was. They had that in Dayton.

The CHAIRMAN. You have been able to begin the work in quantity production only within the last few days. That was due to the constant changes which were made and the consequent impossibility of your getting a revision?

Mr. FISHER. I would say that we have just been able to start assembling. We have been working on production for several months now. We have about a thousand parts of wood sets out.

The CHAIRMAN. You have prepared for the release when it came?

Mr. FISHER. We have been preparing for assembling. We have had work to do on production in producing the parts. We have not completed the hardware. I suppose we have the hardware about one-third completed for these first 1,000 planes.

The CHAIRMAN. You have not gone into the business of the actual production of the machine until the last 8 or 10 days?

Mr. FISHER. The actual assembling.

The CHAIRMAN. That is what I mean.

Mr. FISHER. We have, as I say, about a thousand sets of fuselage woodware out.

The CHAIRMAN. You have been producing parts, but not all of the parts?

Mr. FISHER. Yes.

The CHAIRMAN. How many factories have you in Detroit?

Mr. FISHER. Seventeen plants outside of this.

The CHAIRMAN. What is your total floor space?

Mr. FISHER. Three and one-half million feet in all the plants.

The CHAIRMAN. You say you can produce 2,000 planes between now and the first of November. Can you produce more than that if required?

Mr. FISHER. Our contract reads to do more if we can. In other words, we intended to get these out in less time if it is possible.

The CHAIRMAN. How many of your 18 plants are devoted in whole or in part to aircraft production?

Mr. FISHER. Four of them. This one here, and then we have three others.

The CHAIRMAN. If an emergency should arise requiring increased production, how long would it take you to convert the other plants to the task of aircraft production?

Mr. FISHER. That would depend upon two things. One is if we were going to stay right with this job where the tools are ready, we could produce these in much less time than where you would have to build up new. It all depends upon what they put us on.

The CHAIRMAN. Suppose you were required to develop your capacity for De Haviland four production? How long would it take you to do it?

Mr. FISHER. That is a pretty hard question to answer until you start figuring out how to get the equipment. You have to figure on your material.

The CHAIRMAN. In a pinch, can you produce more than 2,000 machines between now and November?

Mr. FISHER. I think it can be done.

The CHAIRMAN. How many hours are you working a day?

Mr. FISHER. Nine hours.

Senator REED. Are you working more than one shift?

Mr. FISHER. No. We have not been working overtime on any of the parts except shortages, late additions, and changes.

Senator REED. How are you off for material? Have you a good quantity of material on hand for aircraft production?

Mr. FISHER. Yes, we are in good shape on steels and lumber, and the parts that the Signal Corps are going to furnish. Those are parts which we are depending on them for now which are to come. You understand, there are part of these instruments that the Signal Corps has made, and they furnish the complete instrument to install in the plane, and those have to come.

Senator REED. Has any change been ordered recently.

Mr. FISHER. One came in last Saturday.

Senator FRELINGHUYSEN. Explain to us just what that is. We are concerned chiefly in regard to its effect on production.

Mr. FISHER. I understood from information I got yesterday that there were two barrels on the way, so I do not think it will hamper it very much.

Mr. SIMPSON. The dope that they are putting on now is entirely wrong. It deposits a white coat on the inside of the linen and in a month or two will rot the linen out.

Senator REED. Where does this dope come from?

Mr. SIMPSON. From Pratt & Lambert.

Senator REED. Does the Government furnish it to you?

Mr. SIMPSON. It is made according to Government specifications.

Senator REED. When did you discover that?

Mr. SIMPSON. We did not discover it at all. It was discovered in Dayton or somewhere else.

Senator REED. When were you notified of it?

Mr. SIMPSON. Last Saturday.

Senator REED. Since then, of course, you have not been using it?

Mr. SIMPSON. No, sir. Four barrels are coming by express, and have just arrived.

Senator REED. Do you know whether this dope that has this rotting effect on linen has been sent to and used in other factories?

Mr. SIMPSON. I expect it has; yes, sir.

Senator REED. That will tend to retard production will it not?

Mr. SIMPSON. I understand that the dope company have gotten out a new dope called "fifty-fifty" and they will take this dope back and rework it.

Senator REED. Is this the same dope which has been used ever since you began the production of planes?

Mr. SIMPSON. No, sir.

Senator REED. It is a new dope?

Mr. SIMPSON. I don't know. It is an acetate dope.

Senator REED. Is it the same as you used on your training planes?

Mr. SIMPSON. No, sir. That on the training planes is very inflammable and is not suitable for this work.

Senator REED. Mr. Fisher, what do you think you can assure us would be your average production of planes after you begin to send them out?

Mr. FISHER. I figure it will take from eight to ten weeks after we get to shipping to get to capacity.

Senator REED. What will be your capacity then?

Mr. FISHER. From 30 to 40 a day.

Senator REED. During this process, when you are working up to it, how many do you say you will be able to produce in the next four or five weeks?

Mr. FISHER. It will not take us a great while to get up to 10 a day. I feel by the end of this month we will be up to 10 a day.

Senator REED. Now, I will change the subject for a moment. Have you had any experience here with interference in your work, among your workmen, on account of sabotage or anything that would tend to delay production or in some manner interfere with it?

Mr. FISHER. We had one or two cases in the hardware end. One fellow tried to steal a die, but nothing outside of that has occurred, and he was interned.

Senator REED. How long ago?

Mr. FISHER. About six months ago.

Senator REED. That is the only instance you have had?

Mr. FISHER. That is all.

Senator REED. Can you give us any ideas of your own as to what can be done in Washington or in the Bureau of Aeronautics that will expedite production?

Mr. FISHER. The best thing to be done, we think, is to get plane going right, then get to a large production and not make constant changes, but if changes are necessary, make them in such a way so as not to interfere with production.

Senator REED. In other words, if there is no interference between your present orders, you can go ahead and produce in quantity very soon.

Mr. FISHER. Yes; but if at the end of this 2,000 fours we do not have the DH nines ready for production or get an increase in our order for fours, there will be a serious break in our output.

Senator REED. How far in advance ought you to have your orders in order to prevent a break in production?

Mr. FISHER. What you mean, is to give us the information, so we can go ahead and produce the job. We should have four or four and one-half months on an entirely new job to build the tools. We got this job on January 23 and here we are starting in June. We could not do much on that little bunch of prints. We have been a little over four months at this job and when the four and a half months are up, we might say, we have one done and a lot of work done on a thousand of them.

Senator REED. You have a contract for 500 Capronis?

Mr. FISHER. Yes.

Senator REED. Are you going to be required to make your own plans on a machine and then duplicate them for the Curtiss Co.?

Mr. FISHER. That is the expectation.

Senator REED. So that as fast as you turn out your plans you will furnish the Curtiss Co. so they can go ahead simultaneously?

Mr. FISHER. There will be only the time consumed in transmission.

Senator FRELINGHUYSEN. Will you not tell me whether you had to pay a license to the Aircraft Manufacturers' Association on the 400

De Haviland fours that you made? Have you been required to sign the agreement?

Mr. MENDELSON. We did. There have been some changes made that brought those fees down. I would have to refer to our records for that. We did sign up, but there have been modifications since that time.

Senator FRELINGHUYSEN. Were you required to do it by the aircraft authorities in Washington?

Mr. MENDELSON. By their advice.

Senator FRELINGHUYSEN. Did they order you to do it?

Mr. MENDELSON. Practically so.

Senator REED. Who?

Mr. MENDELSON. Just what department it came from I would have to look through the correspondence to ascertain.

Senator REED. Will you give us the correspondence, please?

Mr. MENDELSON. I can not do it now. It is at the main office.

Senator REED. Can you supply it to-night, at the hotel, before we leave?

Mr. MENDELSON. I doubt that, but I will send it down to you. I would not like to commit myself on that positively. What you want is the absolute information. I would like to give you the history of that and will mail it to you to-morrow.

Senator REED. Is this contract which you have on the De Haviland fours a cost-plus contract?

Mr. MENDELSON. Yes.

Senator REED. Did you pay that license out of the percentage profits that you made, or is it charged to the cost of the machine?

Mr. MENDELSON. Charged to the cost of the machine; but I do not think that we get any profit on that. It is charged up.

Senator REED. In other words, the Government pays it?

Mr. MENDELSON. Yes; practically so.

Senator REED. Have you such a contract on the De Haviland fours?

Mr. MENDELSON. I do not think that feature is mentioned in that contract at all. That item was mentioned in the first contract.

Senator REED. You are not paying a license then to the manufacturers' association on the De Haviland four contract?

Mr. MENDELSON. That I would not want to say, Senator. I would want to give you the facts and not let it go by memory. I will mail you all that to-morrow. I will give you the paragraphs in the contract and the correspondence referring to this matter.

Senator FRELINGHUYSEN. Do you believe that this is a fair agreement?

Mr. MENDELSON. We have not talked about that at all. That whole arrangement came through the Government, so it did not interest us.

Senator FRELINGHUYSEN. In other words, the Government forced you to pay to other manufacturers a license for manufacturing these planes for the Government?

Mr. MENDELSON. Well, Senator, I do not want to be evasive, but I want to give you the right dope.

Senator FRELINGHUYSEN. You may answer that from your information. They forced you to pay a license for manufacturing planes for the Government?

Mr. MENDELSON. I would rather you would judge that yourself.

Senator FRELINGHUYSEN. You are paying it, are you not?

Mr. MENDELSON. Well, I think we did pay it, but I would rather give you that correctly.

Senator REED. Is there anything outside of the correspondence?

Mr. MENDELSON. No, sir. Whatever there is connected with that we can cover in actual copies of our documents, and that is what I prefer to do. I do not want to give you any wrong information myself.

Senator FRELINGHUYSEN. You will also inform us whether you have to pay that on the De Haviland four contract and on the Caproni contract?

Mr. MENDELSON. Absolutely. We will give you a full statement of every particular connected with the matter.

Senator FRELINGHUYSEN. What official connection do you bear to the Fisher Body Corporation?

Mr. MENDELSON. Treasurer of this company.

Senator FRELINGHUYSEN. What kind of wheels are you using on the De Haviland four? What is the name of them?

Mr. FISHER. We are using wheels made by several different companies. We split the order with three concerns; with the Springfield Wheel Co., located here in town, and the Standard Wheel Co.

Senator FRELINGHUYSEN. Are you using the Palmer wheel?

Mr. FISHER. Yes, sir; that is specified.

Senator FRELINGHUYSEN. From whom did you specify.

Mr. FISHER. Three concerns, which I have just mentioned.

Senator FRELINGHUYSEN. What is the price of that?

Mr. FISHER. I can not tell you that offhand.

The CHAIRMAN. You can send it to us.

Senator FRELINGHUYSEN. Did you do any business with the Geneva Co.?

Mr. FISHER. I think we have a small contract with them.

Senator FRELINGHUYSEN. Have they offered to furnish these wheels at a less contract price than these three concerns you are doing business with?

Mr. FISHER. Mr. Paxton would have to give you that information.

Senator FRELINGHUYSEN. You can get it and send it to us with the other matter.

Mr. FISHER. You will pardon me as to that question about what the Geneva people are doing. When we wish to place a piece of business we first size up the concerns, what their record has been in the past and what kind of an organization they have, and then we decide where to place the business. The object is to place the business so as to get it and the next thing is what standing the concern has and so on, and I will myself say that it is policy to pay a little more to some concern where you are sure to get it rather than to a concern which has not made good. I am not saying that is the condition that prevails, but that is the way we work.

Senator FRELINGHUYSEN. Are you familiar with this Palmer wheel contract?

Mr. FISHER. I was called in on it when we were ready to leave the order, and I was the one who decided to put it in three places.

and we decided to give it to the Dayton and we placed it with one concern in Detroit, so we had one connection handy, and we had one in the East.

Senator FRELINGHUYSEN. Did you consider the Geneva Co.?

Mr. FISHER. I could not answer that.

Senator FRELINGHUYSEN. Have you purchased any of these wheels from the Engle Aircraft Co. at Niles, Ohio?

Mr. FISHER. I do not think we did. If you want to know just what this wheel business is, as far as we have gone, please put down the questions, and we will answer them. This wheel business has been up in the air for some time.

Senator FRELINGHUYSEN. I understand this Geneva Wheel Co. offered to make this form of wheel and furnish them for \$6.50; that they furnished their plans to other wheel concerns, and the price was first made of \$6.50, and then it was raised to \$9.50 and that these wheels are now purchased at \$9.50, or procurable at that price. Are you getting all the spruce that you need?

Mr. FISHER. Yes; we have not been held up up to this time.

Senator FRELINGHUYSEN. Why are you putting fir in the De Haviland machines. Is not spruce better?

Mr. FISHER. I suppose they would rather have spruce, but they can not get enough spruce, and put in fir. In our estimation we think the fir is just as good. It is a trifle heavier but a little stronger. In order to get the most wing beams out of one piece, fir happens to grow to suit that condition better than spruce.

Senator FRELINGHUYSEN. Was there any fir in the De Haviland machine that was submitted to you to copy?

Mr. FISHER. I do not know. We could not answer that question because it is all covered with linen and paint.

Senator FRELINGHUYSEN. Then you did not strip the machine and test the parts?

Mr. FISHER. No, sir.

Senator FRELINGHUYSEN. Were the wires tested for wire pull on the model plane that you had?

Mr. FISHER. No; we have not taken that apart. The specifications cover what the wires should stand, and that is what we have been working to.

Senator NEW. You are testing those that you are making?

Mr. FISHER. Yes, sir. They test two or three hundred pounds over.

Senator NEW. The Fisher Body Corporation is in a position to go ahead with the rapid production of planes if furnished with plans by the department, and then not interfered with by changes?

Mr. FISHER. We are at that point. We have the complete plans. We are in that position now. If they leave us alone they will get planes.

The CHAIRMAN. If this matter of the license had been left to the Fisher Body Corporation as a matter of expediency which lay within your own determination, would you have paid the Cross license?

Mr. MENDELSON. Certainly not. We do not pay royalties to anybody. We have fought that bitterly ever since we have been in business.

Senator FRELINGHUYSEN. You wanted to make a statement regarding wheels.

Mr. FISHER. They have changed the rims. In the first place, the rims were of soft steel and were not hard enough, and at 60 pounds they commenced to tire out.

Senator FRELINGHUYSEN. When was that discovered?

Mr. FISHER. At the Standard Aircraft Corporation about two weeks ago.

Senator FRELINGHUYSEN. Has it been remedied?

Mr. FISHER. Yes.

Senator FRELINGHUYSEN. It was 12 and should have been 24?

Mr. FISHER. Yes.

The CHAIRMAN. When do you expect wheels?

Mr. FISHER. We have on hand wheels for 1,000 jobs which are all that have been released.

The CHAIRMAN. How soon do you expect to get them?

Mr. FISHER. They are entirely up to the steel when they can get that rim to hold. I had a talk Mr. Paxton yesterday, and Maj. Hazelton, and they are working together on that.

The CHAIRMAN. Does this defect in wheels occur without regard to the sources from which you get them? For instance, are they structurally weak whether you get them from one concern or another?

Mr. FISHER. Yes.

Senator FRELINGHUYSEN. Would it not have been a good plan to take every available concern for wheels?

Mr. FISHER. No.

Senator FRELINGHUYSEN. Would it not have been well to take a company that was manufacturing wheels?

Mr. FISHER. We had nothing to do with the Geneva Co. or any other company. We had the specifications come in here with a sample wheel, and they said, "You have the job; now, you make wheels and get them right at the right time."

(Whereupon the subcommittee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JUNE 7, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Dayton, Ohio.

The subcommittee met at the office of the Dayton Wright Airplane Co., all members of the committee being present, at 10 o'clock a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. C. F. KETTERING.

The CHAIRMAN. You have other plants at Dayton?

Mr. KETTERING. We have a plant up town that is making model fittings, and we have had those people on our emergency fittings, that have come from the last series of changes which have come through.

The CHAIRMAN. Do you make anything except the plane? Do you make the engines?

Mr. KETTERING. No; we just produce planes. We get our engines from the Government.

Senator NEW. What kind of planes are you making?

Mr. KETTERING. De Haviland fighting machines, fours.

Senator NEW. Anything else?

Mr. H. E. TALBOTT. We have completed a contract for 400 standard training ships.

Senator NEW. Has that contract been completed?

Mr. TALBOTT. Yes, sir.

Senator NEW. And you are now devoting all your energies to the De Haviland fours?

Mr. TALBOTT. We could have been through with the De Havilands. We could have finished them at the end of August, and we were figuring we could finish these fighting ships by the first of September but on account of the delay it was dragged out quite a long while.

Senator REED. Will you please give us your name?

Mr. TALBOTT. H. E. Talbott.

Senator REED. What is your connection with the Dayton Wright Airplane Co.?

Mr. TALBOTT. I am chairman of the board of directors.

Senator REED. A stockholder?

Mr. TALBOTT. Yes, sir.

Senator REED. What is the capital stock of the company?

Mr. TALBOTT. \$1,000,000.

Senator REED. When was it organized?

Mr. TALBOTT. Last summer. I can give you the date from the organization papers.

Senator REED. It was organized since the war?

Mr. TALBOTT. Yes, sir.

Senator REED. When was this plant built?

Mr. TALBOTT. A portion of this plant was about completed last summer by another company, and it was purchased by the Dayton-Wright people last summer from that company and it is just about completed, this concrete portion.

Senator REED. The plant was what proportion finished by the former company?

Mr. TALBOTT. Do you mean the plant that we bought from them?

Senator REED. Yes.

Mr. TALBOTT. It was practically finished.

Senator REED. Did you buy the whole plant then?

Mr. TALBOTT. We have added very largely to it.

Senator REED. In order to get a little idea about it, we want to know what portion of the plant you have built new.

Mr. TALBOTT. I think that in money value we have pretty nearly doubled it.

Senator REED. What is the floor space of the whole plant?

Mr. TALBOTT. We will get that for you.

Senator REED. You can express that in acres.

Mr. TALBOTT. I think we have about 20 acres of land.

Mr. KETTERING. In this plant here, in order to get the distinction between the portion which had been built and the other, there were 270,000 square feet in the original plant, and we have added, I think, just about double that here—that is, about 270,000 more.

Senator REED. Here. Then where is the additional plant?

Mr. KETTERING. Miamisburg, 120,000 square feet.

Senator REED. How far is Miamisburg?

Mr. KETTERING. About 6 miles. This plant is about half way between Dayton and Miamisburg.

Senator REED. What was the capacity of that plant?

Mr. KETTERING. 120,000 square feet.

Senator REED. What do you make there?

Mr. KETTERING. We are making propellers, landing gears, and struts.

Senator REED. What do you make in the plant here?

Mr. KETTERING. This is the main erecting plant and, our wood-work, wing booms, and the wing assemblies and the fuselage assemblies, and the mounting of the engines, and the wing coverings, and all that.

Senator REED. You are Mr. Kettering?

Mr. KETTERING. Yes.

Senator REED. What was the name of the company that the Dayton-Wright Co. bought out or succeeded?

Mr. KETTERING. The Domestic Building Co.

Senator REED. What was its capital?

Mr. KETTERING. I can not tell you offhand, but I can give you the figures.

Senator REED. What was your connection with that company?

Mr. KETTERING. I was vice president.

Senator REED. Who were the directors of that company?

Mr. KETTERING. I can not give you that.

Senator REED. Was Mr. Deeds connected with it?

Mr. KETTERING. Yes.

Senator REED. In what way was he connected with it?

Mr. KETTERING. He was president of the company.

Senator REED. You were what, a director, or a vice president?

Mr. KETTERING. A vice president.

Senator REED. How much financial interest did Mr. Deeds have in that company?

Mr. KETTERING. I think it was at least 40 per cent.

Senator REED. And you were a heavy holder?

Mr. KETTERING. Yes.

Senator REED. Were there many stockholders?

Mr. KETTERING. No, not very many. Very few. If I can give you an idea of how this Domestic Building Co. was organized it will answer these questions. Mr. Adam Schantz, who is one of our best men in town for city development, was asked by the chamber of commerce or the board of trade to go outside of the city and determine where we could get a manufacturing extension tract that would have the best facilities. That was some eight or nine years ago. We did that and selected a tract of land down here which is really a three-cornered piece bounded by natural things like roads and a river. It lies between one of the city thoroughfares and the river. We wanted to build a factory out here, and we got an option on a piece of ground here and found Mr. Sharp had a major option on it. That is, he owned part of it and had an option on the other part. Then we went to work and closed up this lease on a section of ground here of about 125 acres. The Domestic Building Co. bought that to build this plant and another plant which is located immediately below here.

Senator REED. To do what?

Mr. KETTERING. This Domestic Building Co. built this plant for the manufacturing of lighting plants.

Senator REED. Lighting plants to be used principally on farms?

Mr. KETTERING. Yes, sir.

Senator REED. That was the business you were going into?

Mr. KETTERING. Yes.

Senator REED. When was that company organized?

Mr. KETTERING. As near as I can remember, about three years ago.

Senator REED. Mr. Deeds owned about 40 per cent of it and you owned about how much?

Mr. KETTERING. About 45 or 50 per cent.

Senator REED. And you two men practically owned the company?

Mr. KETTERING. Yes.

Senator REED. Were you interested in it, Mr. Talbott?

Mr. TALBOTT. No, sir; I was not interested in it.

Senator REED. I am going to come back and ask you, Mr. Kettering, had you or Mr. Deeds had any experience in building these lighting plants before you organized this company?

Mr. KETTERING. Yes. Will you let me digress a little. I just wanted to give you the story of it. In 1908 and 1909 I was with the International Cash Register Co. and had been playing along with automobiles, and had developed some apparatus for an automobile,

and we worked out this self-starting stuff for the automobile. When we began to ship those around over the country, we got a call from Florida. I suppose a thousand of them had been sent out. They wanted us to ship three complete sets to Florida, and we naturally supposed that the man was in trouble. We thought maybe he had had an accident, and we got out and found out that the man wanted to use these outfits to light cottages, because they would run their automobiles alongside the cottage and light the house. We said if people wanted electric lights that bad we would develop them something that was right, because this was developed entirely for an automobile, so we spent a good deal of time and money and developed this work up to the point of making fifteen or twenty of the sets, and then we were going to organize to manufacture those things, and we immediately hit this proposition, that when we tried to manufacture that in the same plant with the self-starting end of the thing, which was all a sales proposition and contrasted with the automobile office, where it was practically all manufacturing and supplying the general wholesale trade—so the company was divided into two companies and we got a general manager for the Domestic Engineering Co. which was going to manufacture these things, who had had a great deal of sales experience with the National Cash Register Co., and that is the way these companies came into existence.

Senator REED. Had Mr. Deeds been in the cash Register Co.?

Mr. KETTERING. Yes.

Senator REED. And you had been in the National Cash Register Co.?

Mr. KETTERING. Yes.

Senator REED. And Mr. Deeds and you went in the business together of making these self-starters?

Mr. KETTERING. Yes.

Senator REED. And that company that made the self starter was called what?

Mr. KETTERING. The Delco.

Senator REED. And that is where the Delco ignition system was developed, too, was it not, and when you took on this new business of lighting houses, you then organized another company which you called——

Mr. KETTERING. The Domestic Engineering Co. The Domestic Building Co. was the company which was organized to build these buildings down here. To remove the confusion, they built these buildings down here for the Domestic Engineering Co. and the Smith Gas Engineering Co.

Senator REED. You and Mr. Deeds were in the National Cash Register Co. together?

Mr. KETTERING. Yes, sir.

Senator REED. And were part owners of the Cash Register Co.?

Mr. KETTERING. No, I never had any stock in it.

Senator REED. Did Mr. Deeds own any part of it?

Mr. KETTERING. I do not know. I was simply brought here as a designer.

Senator REED. When you and Mr. Deeds went out of the National Cash Register Co., what was the first company you and Mr. Deeds were interested in?

Mr. KETTERING. I left the National Cash Register Co. in 1909 and started to design some of this automobile stuff, and Mr. Deeds helped me finance that.

Senator REED. Finance what?

Mr. KETTERING. That first company, called the Dayton Engineering Laboratories Co.

Senator NEW. That is where you get your Delco?

Mr. KETTERING. Yes.

Senator REED. That was organized about what time?

Mr. KETTERING. I should say about 1909.

Senator REED. Did Mr. Deeds have a financial interest in that company?

Mr. KETTERING. Yes.

Senator REED. How much?

Mr. KETTERING. I can not tell you.

Senator REED. What was the stock?

Mr. KETTERING. I can not remember that.

Senator REED. Approximately?

Mr. KETTERING. I can not give you that, because I never paid any attention to the financial side of it. I simply operated the business. I had a financial secretary.

Senator REED. Who owned the company?

Mr. KETTERING. Col. Deeds and myself owned the major part of the stock.

Senator REED. How much do you mean by the major part? Practically all of it?

Mr. KETTERING. Practically all of it; yes.

Senator REED. You do not remember how much the stock was?

Mr. KETTERING. No, I do not.

Senator REED. That company developed, among other things, the Delco ignition?

Mr. KETTERING. The lighting and starting of automobiles, and the whole general line of apparatus that goes on automobiles.

Senator REED. What was the next company you organized?

Mr. KETTERING. Then that company, you might say, just split in two, making this Domestic Engineering Co.

Senator REED. That company, the Dayton Engineering Laboratories Co., still exists?

Mr. KETTERING. Yes.

Senator REED. And you do not know how much its capital stock is?

Mr. KETTERING. No.

Senator REED. You do not know how much stock you own in it?

Mr. KETTERING. I do not own any of it, because we sold all that stock to the United Motors Co.

Senator REED. The Dayton Domestic Engineering Co. was developed before you sold out that company?

Mr. KETTERING. Yes, about a year and a half before.

Senator REED. When was it that you organized the Domestic Engineering Co?

Mr. KETTERING. It was approximately three years ago, just roughly.

Senator REED. You do not know what the capital stock of the Domestic Engineering Co. was?

Mr. KETTERING. No, sir. That was raised about the latter part of last year.

Senator REED. What were the first figures?

Mr. KETTERING. I can not give you that.

Senator REED. Can you not approximate that?

Mr. KETTERING. No, sir. I can not, because I can not remember the figures. I can get you that whole thing.

Senator REED. About three years ago, then, you sort of split the Delco Co., I will call it, and built the Domestic Engineering Co.?

Mr. KETTERING. Yes.

Senator REED. And you can not now state the capital stock?

Mr. KETTERING. No.

Senator REED. And you and Col. Deeds owned the Domestic Engineering Co., also, practically?

Mr. KETTERING. Yes, sir, about two-thirds.

Senator REED. Who owned the other third?

Mr. KETTERING. The other third is owned by about half a dozen boys who are the operating company. Every one of those details can be given to you later.

Senator REED. Are you and Col. Deeds interested in any other companies than these two?

Mr. KETTERING. Well, we are interested in the Smith Gas Engineering Co. here.

Senator REED. When was that organized?

Mr. KETTERING. That has been organized 10 or 12 years. That was organized by a former roommate of mine up here in a small town, Lexington, Ohio, and they got up to the point of doing a lot of research work and they could not do it in Lexington, and we bought an interest of a banker in that plant, 40 or 45 per cent.

Senator REED. And that you and Mr. Deeds still have.

Mr. KETTERING. Yes.

Senator REED. How much of that does Mr. Deeds own and how much do you own?

Mr. KETTERING. About 15 per cent apiece. I do not remember the figures, but we can get them for you.

Senator REED. Let us go back to the Delco Co., which was organized in 1909, and you and Mr. Deeds owned practically all of it. It developed as an offshoot to the Domestic Engineering Co. Which one of these companies that you have just named started to build this plant?

Mr. KETTERING. The Domestic Building Co. for the Domestic Engineering Co. The reason for the formation of this building company is something with regard to the building laws, or the capitalization or something.

Senator REED. The Domestic Building Co. was simply a company organized to build these buildings, and then went out of existence?

Mr. KETTERING. Yes.

Senator REED. And it was merely the tool or machine that you employed as an organization to build the buildings for the Domestic Engineering Co.?

Mr. KETTERING. Yes.

Senator REED. Do you own any stock in the Delco?

Mr. KETTERING. The only stock I own in the Delco Co. is some of the United Motors Co. stock.

Senator REED. When you sold the Delco Co. to the United Motors, did you get paid in stock of the United Motors Co. or in cash?

Mr. KETTERING. We got paid about 50 or 60 per cent in cash and the rest in stock.

Senator REED. And the rest of it in United Motors stock?

Mr. KETTERING. Yes.

Senator REED. Was the cash and stock apportioned between yourself and Mr. Deeds so that each of you got some stock and each of you got some cash?

Mr. KETTERING. Yes.

Senator REED. Does Mr. Deeds own that stock to-day in United Motors?

Mr. KETTERING. I do not know a thing about it.

Senator REED. You still own your stock?

Mr. KETTERING. I do.

Senator REED. Would you mind telling us how much cash and how much stock you received in United Motors?

Mr. KETTERING. No, sir. I can give you those figures.

Senator REED. When was this deal made?

Mr. KETTERING. About a year and a half or two years ago.

Senator REED. Was it before our entrance into the war?

Mr. KETTERING. Yes, quite a while.

Senator REED. And United Motors was really absorbing this system of lighting that you had gotten up and also the starting system?

Mr. KETTERING. Yes. The automobile end of it. United Motors consisted of an organization of ball-bearing companies, roller-bearing companies and two of these lighting and starting companies, and a radiator company, and you might say it was a major accessory organization.

Senator REED. Does Mr. Deeds own the stock yet that he got from United Motors?

Mr. KETTERING. I do not know.

Senator REED. Did he own it the last time you knew anything about it?

Mr. KETTERING. The last time I thought about United Motors stock was some time last summer.

Senator REED. Where is the United Motors Co. located?

Mr. KETTERING. They have their offices in New York.

Senator REED. Where is their plant?

Mr. KETTERING. The Hyatt Roller Bearing Co. is at Newark; the New Departure Ball Bearing Co. in New Haven, and the Reno Electric at Anderson, and the Harrison Radiator Co.—

Senator REED. Did you have anything to do with the management of the Delco Co. here?

Mr. KETTERING. I was president of it.

Senator REED. You said the Delco Co. had been sold to the United Motors Co.

Mr. KETTERING. It has been.

Mr. TALBOTT. All these independent companies are being operated by local organizations.

Senator REED. That is to say, the Delco Co. still exists as a company and it still continues to operate the plant, doing business as it did from the start?

Mr. KETTERING. Yes.

Senator REED. But how is it, then, owned by the United Motors Co.?

Mr. KETTERING. It is just like the Cadillac Motor Car Co. and the Buick Motor Car Co. and those companies are part of the General Motors Co.

Senator REED. Was the transfer made by turning over the stock in the Delco Co. all the shares of the stock to the United Motors Co.?

Mr. KETTERING. Yes, sir.

Senator REED. So that the United Motors Co., having those shares of stock in its ownership and perhaps in its vault, in that way controls the organization of the Delco Co.?

Mr. KETTERING. Yes.

Senator REED. And you retain the position of president of the Delco Co., operating it in that way for the General Motors Co.?

Mr. KETTERING. Yes.

Senator REED. What is the estimated actual cash value of this whole company, real estate and everything?

Mr. KETTERING. I should say six or seven million dollars.

Senator REED. What is paid for each Delco equipment that you put on each Liberty motor?

Mr. KETTERING. I think that is about \$112.

Senator REED. And you have contracts for how many equipments?

Mr. KETTERING. I think about 20,000 equipments.

Senator REED. You say the value of this Delco plant is probably \$7,000,000?

Mr. KETTERING. Yes.

Senator REED. Has anything been added to it since the transfer was made to the General Motors?

Mr. KETTERING. Yes; we have been adding to the thing right along as the demands of trade require.

Senator REED. Has the plant been greatly enlarged?

Mr. KETTERING. Not greatly enlarged.

Senator REED. How much has been added to it, practically?

Mr. KETTERING. Well, we have added, I suppose, 100,000 square feet of floor space.

Senator REED. How much in value has been added to it? I do not mean in the rise in the value of your stock.

Mr. KETTERING. I suppose a million dollars.

Senator REED. So there must have been about \$6,000,000 in value here when you made your transfer?

Mr. KETTERING. Yes.

Senator REED. Does that value consist largely in the patents that you held and in the fact that you were able to manufacture something that other people could not produce?

Mr. KETTERING. No.

Senator REED. Or was it actual cash investment?

Mr. KETTERING. No, we never carried our patents.

Senator REED. It was actual cash?

Mr. KETTERING. Yes, money, machinery and buildings.

Senator REED. I mean did you take cash originally to buy these properties?

Mr. KETTERING. Yes.

Senator REED. It was not hot air or anything of that sort?

Mr. KETTERING. It was not.

Senator REED. So that you had \$6,000,000 invested here at the time you went into United Motors and in that \$6,000,000 investment you owned about 45 per cent and Mr. Deeds owned about 45 per cent?

Mr. KETTERING. Yes.

Senator REED. And you got your pay in cash and stock in United Motors?

Mr. KETTERING. Yes.

Senator REED. And you do not know how much stock you got or how much Mr. Deeds got, but you can get me a memorandum about it?

Mr. KETTERING. Yes, absolutely, every detail.

Senator REED. Of course, the contract that is made now between the Delco Co. and the United States Government, while it is made in the name of the Delco Co. is, in fact, the property of the United Motors Co.

Mr. KETTERING. Yes.

Senator REED. Because it owns all of the stock?

Mr. KETTERING. Yes.

Senator REED. It is the holding company?

Mr. KETTERING. Yes. I do not understand those things. I can understand a piece of machinery, but not all these things.

Senator REED. Let us take up the Domestic Engineering Co. Does it still exist?

Mr. KETTERING. Yes.

Senator REED. As a separate organization?

Mr. KETTERING. Yes.

Senator REED. Has its stock been sold or transferred in any way?

Mr. KETTERING. No; it is just as it originally was.

Senator REED. How much is the stock of that company?

Mr. KETTERING. I could not give you that.

Senator REED. Would you approximate it?

Mr. KETTERING. No.

Senator REED. Do you know what the investment is?

Mr. KETTERING. Yes; about three and one-half or four million dollars.

Senator REED. How much of that do you own and how much does Mr. Deeds own?

Mr. KETTERING. I own one-third of it and I think Mr. Deeds owns one-third, and the boys own one-third.

Senator REED. What does the Domestic Engineering Co. manufacture?

Mr. KETTERING. They manufacture these farm-lighting sets.

Senator REED. Anything else?

Mr. KETTERING. No.

Senator REED. No Government contracts?

Mr. KETTERING. No. Only just the contracts where the Government has ordered sets of this kind for X-rays and things like that.

Senator REED. Just small contracts which have nothing to do with the war?

Mr. KETTERING. Yes. The Government, for instance, bought a lot of machines for X-ray work and the Government work we are

doing is the same thing; that is, the Government has bought a lot of these machines.

Senator REED. The same as anybody else would buy?

Mr. KETTERING. Yes. We have no Government contracts covering special Government apparatus. I think the Government has bought two or three thousand of those machines.

Senator REED. Col. Deeds would not be in a position to have anything to do with the ordering of those?

Mr. KETTERING. Not a thing.

Senator REED. He just bought them on the market?

Mr. KETTERING. Yes.

Senator REED. Is the Domestic Engineering Co. making anything for any companies, or furnishing anything to any companies that have Government contracts. And when I say that I do not mean merely furnishing a lighting system to them, but making anything that goes into war contracts.

Mr. KETTERING. No.

Senator REED. The Smith Gas Engineering Co. was organized about 10 years ago and is still in existence?

Mr. KETTERING. Yes.

Senator REED. What is its business?

Mr. KETTERING. They make the gas producers for producing gas for ordinary industrial operations like heat-treating furnaces, and bake ovens and glass retorts for making glass.

Senator REED. You own about 15 per cent of the stock and Col. Deeds owns about 15 per cent?

Mr. KETTERING. Yes.

Senator REED. What values have you in that plant?

Mr. KETTERING. It is a very small company, not over a half million dollars.

Senator REED. Has that company any Government contracts, or Government business?

Mr. KETTERING. Not directly. They have been building or are building to-day gas producers for steel companies who have Government contracts.

Senator REED. For instance, a steel company over here has a Government contract and has to have heating apparatus and you sell it to them?

Mr. KETTERING. Exactly.

Senator REED. And that company has something to do with Government contracts?

Mr. KETTERING. That is the idea.

Senator REED. So that the only Government contract that you have anything to do with all comes through your stock ownership in the Delco Co. or rather in the stock that has been substituted for Delco stock; that is, United motors stock?

Mr. KETTERING. Yes, sir.

Senator REED. This company where we are sitting talking is called the Dayton-Wright Co.?

Mr. KETTERING. The Dayton-Wright Airplane Co.

Senator REED. I am going to take up now the Domestic Engineering Co. I think I have already asked you about the stock in that?

Mr. KETTERING. Yes.

Senator REED. How much did you say the stock was?

Mr. KETTERING. I do not remember.

Senator REED. How much is the value in it?

Mr. KETTERING. About \$3,500,000.

Senator REED. The Domestic Engineering Co. was owned, when it was organized three years ago, by you and Mr. Deeds?

Mr. KETTERING. And a bunch of the boys.

Senator REED. That is, one-third to you and one-third to Mr. Deeds and one-third to a bunch of the boys?

Mr. KETTERING. Yes.

Senator REED. You do not remember the amount of stock?

Mr. KETTERING. Yes; but I can give you that. It was approximately the same amount.

Senator REED. You still own your stock in the Domestic Engineering Co.?

Mr. KETTERING. Yes.

Senator REED. Does Col. Deeds still own his stock?

Mr. KETTERING. Yes.

Senator REED. The Domestic Engineering Co. owns this plant that we are sitting in?

Mr. KETTERING. No; the Dayton-Wright Airplane Co. owns it now.

Senator REED. When did they sell it to the Dayton-Wright Airplane Co.?

Mr. KETTERING. Last summer. We can get that date for you.

Senator REED. The Domestic Engineering Co. owned the entire plant and the entire plant was turned over to the Dayton-Wright Co.?

Mr. KETTERING. No. We had a plant up town and this was simply an extension of the plant into which we had never moved.

Senator REED. The Domestic Engineering Co. had a plant at Dayton, and then they came out and bought this great plant that we are sitting in?

Mr. KETTERING. Yes.

Senator REED. And this plant that we are sitting in is the one you describe as having how many feet of floor space?

Mr. KETTERING. 270,000.

Senator REED. It was not yet occupied?

Mr. KETTERING. We had about 35 or 40 carloads of stuff moved in.

Senator REED. It was only partly built?

Mr. KETTERING. The heating and power system were put in.

Senator REED. It was a new plant?

Mr. KETTERING. Yes, a brand new plant.

Senator REED. Now, following the Domestic Engineering Co. through for a moment, in which you owned a third and Col. Deeds owned a third, and the boys in the plant owned a third; you proceeded to then sell this plant which we are now sitting in, which was part of the property of the Domestic Engineering Co., to the Dayton-Wright Co. For how much did you sell it to the Dayton-Wright Co.?

Mr. KETTERING. Something like \$900,000; whatever it cost, or approximately.

Senator REED. Who organized the Dayton-Wright Co.?

Mr. KETTERING. Mr. H. E. Talbott and his son.

Senator REED. When?

Mr. KETTERING. We will get those dates?

Senator REED. Were the transactions for cash or stock?

Mr. KETTERING. Which, between the Domestic Engineering Co.?

Senator REED. Yes..

Mr. KETTERING. Cash; no stock.

Senator REED. Was Col. Deeds ever interested in any way in the Dayton-Wright Co.?

Mr. KETTERING. No.

Senator REED. Col. Deeds was interested in the real estate which was sold to the Dayton-Wright Co., and the buildings which were sold to the Dayton-Wright Co.?

Mr. KETTERING. Yes.

Senator REED. When was that transaction actually made?

Mr. KETTERING. Last summer. We will give you that date.

Senator REED. It was after Col. Deeds had gone into the Army?

Mr. KETTERING. I have not the date of his going into the Army, but I think that we can give you the date of the transaction.

Senator REED. He went into the Army on the 27th of August.

Mr. TALBOTT. I think it was about a year ago.

The CHAIRMAN. He went into the Government service in June, and into the Army in August.

Senator REED. Was the transaction actually all closed up at one time, or did it hang fire for a time?

Mr. TALBOTT. I think it was closed right up. I do not remember.

Senator REED. Was there anything about this transaction by which Col. Deeds retained any kind of an interest in the Dayton-Wright Co.?

Mr. KETTERING. Not in any way.

Senator REED. Not any stock?

Mr. KETTERING. Not a thing; absolutely.

Senator REED. If I understand you, gentlemen, and I do want to be understood on this, I am going to say to you frankly, there has been a great deal of rumor in the air about Col. Deeds having retained an interest in the Dayton-Wright Co.

Mr. KETTERING. We would like to lay every bit of that on the table and answer every question you care to ask.

Senator REED. I am not saying this to reflect on Col. Deeds. You say to me now, both of you gentlemen, this sale of the properties of the Domestic Engineering Co., which constitute this plant which we are not sitting in, was an absolutely clean-cut sale to a new company which was organized in which Col. Deeds had no interest whatsoever?

Mr. KETTERING. That is absolutely the case.

Mr. TALBOTT. That is absolutely the case.

Senator REED. Neither absolute nor prospective?

Mr. KETTERING. Neither absolute nor prospective.

Mr. TALBOTT. When we said that Col. Deeds had no interest in this company, we should have added, but he was one of the signers of the incorporation paperes of this company, but he never subscribed for any stock and never had a dollar of ownership in it.

Senator REED. Mr. Talbott, when did you first talk about organizing the Dayton-Wright Co.?

Mr. TALBOTT. Just about a year ago.

Senator REED. That was after we got into the war?

Mr. TALBOTT. Yes, sir.

Senator REED. Whom did you first talk with about organizing the Dayton-Wright Co.?

Mr. TALBOTT. I do not know just whom we talked with first, but we had had—I think you should have the story of how we got into this game. Something like a year before this country entered the war Col. Deeds, and Mr. Kettering and myself and Orville Wright decided to start in a small way a research laboratory for the development of aircraft work, and we did that. Anyway, three or four of us started to develop aircraft and actually built some sport machines and were flying them.

Senator REED. Did you have a company or was that just a partnership?

Mr. TALBOTT. I will have to look that up. Our interests have been rather involved. It was not done in the expectation of profit, but we wanted to put all the Wright genius to work, and some of the companies in the East had bought his properties, and we wanted to retain the development of aircraft in our home city and wanted to give Mr. Orville Wright every opportunity to go ahead in the art, and it was just that little organization that went into the aircraft game, and then when we were in the war we had a little flying field and a little machine shop and wood-working shop and hangars and two or three machines that we had built.

Senator REED. Col. Deeds was in that organization, whether it was a partnership or whatever it was?

Mr. TALBOTT. Yes, sir.

Senator REED. After we got into the war you four men, I suppose, talked about the fact that there ought to be a company created to build aircraft?

Mr. KETTERING. No; we did not talk about it. Some people came in from Washington before we had any thought of using this plant for that purpose, and they said, "It is a crime to let that plant over there go into a non-war industry."

Senator REED. Who was that?

Mr. KETTERING. I do not remember, but I think I can find out.

Senator REED. Was it Col. Squier?

Mr. KETTERING. No; Col. Squier was out here and Mr. Howard Coffin was out here and Col. Waldon and Mr. Carmack.

Senator FRELINGHUYSEN. Maj. Shepler and Col. Montgomery?

Mr. KETTERING. No; it was before the time of those people. In connection with what Mr. Talbott has told you, Mr. Wright had himself an experimental laboratory up town, but he had no flying field with it, and this was simply a field laboratory complementing his research laboratory.

Senator REED. So your attention was first called to the fact by the people representing the Government who talked to you about the desirability of making aeroplanes at this point and employing this property for that purpose?

Mr. KETTERING. Yes.

Senator REED. Was Col. Deeds here at that time?

Mr. KETTERING. Col. Deeds was here and in Washington. He was back and forth, I think, early in the year.

Senator REED. You consulted with him, I suppose, in regard to this whole matter?

Mr. KETTERING. Oh, yes.

Senator REED. And the result of that consultation was that the Dayton Wright Co. was organized?

Mr. KETTERING. The result of those conferences developed the change in plan of the Dayton-Wright Co. It had been organized for this little purpose into the bigger purpose, which is the same thing.

Senator REED. I assume, Mr. Talbott, that of course you did not organize this great company and turn this great plant over to it unless you knew you were going to get some work; that the Government was going to use it?

Mr. TALBOTT. We felt pretty well satisfied as to that.

Senator REED. Who was it that gave those assurances?

Mr. TALBOTT. Mr. Coffin was the man that came down here and wanted to know if we could build some flying ships to help the Curtiss people out.

Senator REED. Do you remember when he came?

Mr. TALBOTT. It must have been in May of last year. They came down here and along in the early part of June or the middle of June we went to the Curtiss plant and had a conference with the Curtiss people to see whether it was applicable to put a Hall-Scott motor in a Curtiss training machine, so that was along about this time last year when they were first trying to get flying machines. They wanted to build four or five training machines.

Senator REED. Who wanted to know that?

Mr. KETTERING. I think Mr. Coffin. There was Mr. Coffin, and I am trying to think who was the other man.

Mr. TALBOTT. It might be interesting to find out why they came out here. Here was Mr. Orville Wright and foreign airplane men knew it was his last design in an airship that he had built and was flying. I think that attracted a lot of these people here to Dayton in the early part of the program.

Senator REED. When was it that you got the assurance that you were going to get an order for about 500 planes?

Mr. TALBOTT. I should like to put it the other way. They requested us to build 400 training ships.

Senator REED. That is the date I want to get.

Mr. TALBOTT. We can get that for you.

Senator REED. I do not mean necessarily the date when the contract was closed, but when this early request was made, so that you knew that they wanted you to take the contract.

Mr. TALBOTT. Yes.

Senator REED. Do you think you can fix that date?

Mr. TALBOTT. Yes, sir, within a day or two anyway.

Senator REED. You finally made a contract for how many planes?

Mr. TALBOTT. 400 training planes.

Senator REED. Is that the only contract you have had up to date?

Mr. TALBOTT. No.

Mr. KETTERING. Let me explain one thing. We said: "If you want us to build airplanes, we must have an engineering organization and that kind of stuff, and we simply have not got the people and the

strength and energy to go ahead and organize another big engineering company to handle this." They said: "You will not have to have any engineering department whatever. We will turn over to you the drawings and all you will have to do will be to duplicate those parts and make airplanes," and we fussed around for a week or two, and then they said, "We will send you the drawings and you can look them over and see that every part is there." It was with that assurance that we took this order.

Senator REED. When was it?

Mr. KETTERING. In May or June of last year when they came up. Exactly the opposite thing happened. The drawings sent here were not applicable.

Senator REED. Who was it that asked you people to undertake the building of these 400 planes?

Mr. KETTERING. Mr. Coffin was the man, I am pretty sure.

Senator REED. He came here?

Mr. KETTERING. Yes, with a bunch of Englishmen and, I think, Gen. Carmack.

Senator REED. Gen. Carmack was in charge of the English airplanes at that time?

Mr. KETTERING. Yes. They spent a day here and said it was a shame to let this plant do nothing.

Senator REED. Col. Deeds took part in this conference with you?

Mr. KETTERING. I do not think he was here.

Senator REED. You talked it over with him?

Mr. KETTERING. Yes.

Senator REED. And the result was that you and Mr. Wright and Col. Deeds and Mr. Talbott, having this demand made upon you by the Government, a request for 400 of these planes, then proceeded to create the organization which is known as the Dayton-Wright Co.?

Mr. KETTERING. Yes.

Senator REED. Why is it that Col. Deeds, who had been with you up to that time in all these ventures, did not take stock in the Dayton-Wright Co.?

Mr. KETTERING. There were several reasons. In the first place, he had taken on the work in the Miami Conservancy project. That is the big flood prevention work that is going on here.

The CHAIRMAN. For the Government?

Mr. KETTERING. No, it is a local proposition, and he was desirous of not going into any more manufacturing work, and that was before he had any idea, I think, of going to Washington or staying in Washington.

Senator REED. He was in Washington on the Liberty motor immediately after the war began, was he not?

Mr. KETTERING. Was he not in the ordnance work for a while down there?

Senator FRELINGHUYSEN. I have the testimony at the hotel, Col. Deed's testimony as to that.

Mr. KETTERING. I think there were several reasons, one of which was the Miami Conservancy.

Senator FRELINGHUYSEN. Had the Bristol fighters arrived here yet?

Mr. KETTERING. There was one sent down here that we have over in our—

Senator FRELINGHUYSEN. Did they fly here?

Mr. KETTERING. No. That, Senator, refers to the McCook field.

Senator NEW. Bristol fighters are sent to McCook field and not here.

The CHAIRMAN. You do not want to confuse this place with the McCook field.

Mr. KETTERING. That is the idea.

Senator FRELINGHUYSEN. What was the first contract you had?

Mr. KETTERING. Four hundred train planes.

Senator FRELINGHUYSEN. What was the mount of that contract?

Mr. KETTERING. I think they were about \$4,630 apiece. Shall I get the contract?

Senator REED. Yes.

Mr. TALBOTT. The contract provided for a sliding basis of remuneration.

Senator FRELINGHUYSEN. That is about \$1,700,000 for the training planes?

Mr. TALBOTT. Yes, sir.

Senator FRELINGHUYSEN. And on that contract you built the factory; is that so?

Mr. TALBOTT. We built the factory for that contract?

Senator FRELINGHUYSEN. Yes.

Mr. TALBOTT. No, because when they sent us the drawings for the this ship and we were building the model and developing it and flying it they also wanted us to do the same thing with the De Haviland fours, with what meager information they were able to get about the De Haviland fours, and they both then came along together, and the large development here was not made until the De Haviland contract came in with it, Senator.

Senator FRELINGHUYSEN. You established this factory and capitalized it at \$1,000,000. You were encouraged to do that by reason of certain contracts which were promised you by the Government?

Mr. TALBOTT. Yes.

Senator FRELINGHUYSEN. What was the amount of those contracts which were promised you before the factory was built and equipped.

Mr. TALBOTT. I suppose the total volume of business would run to \$25,000,000 or \$26,000,000. That is, the total volume of business that we were promised was \$25,000,000 to \$28,000,000.

Senator REED. You say that was before the factory was built and equipped. Was it before the Dayton-Wright Co. was organized?

Mr. TALBOTT. No, the Dayton-Wright Co. was organized before that. We will have to look up the dates.

Senator REED. When I said the Dayton-Wright Co., I meant the present Dayton-Wright Co.

Mr. TALBOTT. I am not sure of that.

Senator REED. Have you not got your records right here?

Mr. TALBOTT. They are all at the uptown office. It might be interesting to you to know that there was a meeting here of the Fisher Body Corporation and two or three others at about the same time. This was not a transaction between us and the Government so much as a transaction between three or four prospective airplane manufacturers and the Government.

Senator REED. Do I get you right that it was after you had assurance of these contracts that you have just spoken of that you pre-

pared then to carry out the work by creating the Dayton-Wright Co. and by proceeding to turn over to it this plant, and then proceeded to get your organization together?

Mr. TALBOTT. Yes.

Senator REED. Then, coming along to a time a little later than that you got your orders from the Government?

Mr. TALBOTT. Yes, sir.

Senator REED. I am asking you now whether Col. Deeds continued in this movement and in your organization up to the time of the actual preparation of the articles of association for your charter? He signed a charter and he was with you up to that time in all these procedures?

Mr. TALBOTT. Yes, sir.

Senator REED. What is the reason that he stepped out at that time?

Mr. TALBOTT. Because he contemplated going into the Government service.

Senator REED. Did he get anything whatsoever for his interest? He had been in the Dayton-Wright Co. and he had been in this company down here which you call the Domestic Engineering Co., and when this property was turned over to the Dayton-Wright Co. something was paid for it, was there not?

Mr. TALBOTT. Yes, sir.

Senator REED. How much was paid for it?

Mr. TALBOTT. I will give you that amount, but it was determined by the Government in sending out engineers and accountants to go over all the books to determine what the Domestic Building Co. had actually expended on these buildings, and the Domestic Building Co. sold this plant at the cost price as determined and checked by the Government representatives, without profit to the sellers. It may be a loss to the buyers. We do not know, yet.

Senator REED. Was there anything paid in the way of stock or in the way of money for this property that had belonged to the Domestic Engineering Co. and which was turned over to the Dayton-Wright Co., or was it paid for in stock in the Dayton-Wright Co.?

Mr. TALBOTT. It was paid for in cash or its equivalent. It was not all paid in cash. I have not the terms of transaction.

Senator REED. Do you mean money or notes?

Mr. TALBOTT. Money or notes.

Senator REED. Was there anything paid or agreed to be paid on anything except the physical properties that were turned over?

Mr. TALBOTT. Nothing, not a cent.

Senator REED. There was no allowance made of any kind or character for these contracts that you expected to get from the Government?

Mr. TALBOTT. Not in any way; and the total amount paid was determined and approved by Government accountants and engineers who were sent out here to see that the whole transaction was carried through on an absolute cost basis.

Senator REED. It had been, however, at that time agreed and understood that the Dayton-Wright Co. would get these airplane contracts that you have spoken of. We have been over that, and I think that is cleared up. So that the Government accountants

checked up the values of your property here. How did they arrive at the value of the real estate?

Mr. TALBOTT. I do not know how they arrived at the value of the real estate except to inquire from real estate people in the city of Dayton and to determine it from the best evidence they could get from disinterested parties.

Mr. KETTERING. They had the prices which were paid.

Senator REED. Did they give you an advance on the price which had been paid?

Mr. KETTERING. I do not remember. My recollection is that approximately it was \$1,000 an acre or \$1,200.

Mr. TALBOTT. I think the whole transaction was less than \$20,000 in its entirety.

Senator REED. The Domestic Engineering Co. had intended to occupy these buildings, and had it not been for the war would have occupied them?

Mr. TALBOTT. Yes; we were already moving in here.

Senator REED. What has become of this Domestic Engineering Co. under these circumstances?

Mr. TALBOTT. We have increased the plant uptown.

Senator REED. You have already said that it has no Government business?

Mr. TALBOTT. Yes.

Senator REED. Did Col. Deeds get some \$9,000 out of some of these deals?

Mr. KETTERING. No; because the total amount paid was only about \$9,000.

Mr. TALBOTT. I think it was less than that.

Senator REED. Did he take down his part of the money when the Dayton-Wright Co. transfer was made, or did the money go back into the Domestic Engineering Co. and stay there?

Mr. TALBOTT. I can not say as to that.

Senator REED. You all know whether you drew this money out of the Domestic Engineering Co., do you not?

Mr. TALBOTT. We took some money and increased the Domestic Engineering Co.'s plant uptown. We can show you the books just where this particular money went. In order to handle the business uptown we built some buildings uptown. That is another company, still, that we have not touched on in this matter, that built those buildings.

Senator REED. What is this other company that you say gets into the game?

Mr. TALBOTT. I refer to the Dayton Metal Products Co.

Senator REED. When was it organized?

Mr. TALBOTT. It was organized about three or four years ago.

Senator REED. What is its capital?

Mr. TALBOTT. Its capital is \$200,000.

Senator REED. What is the property worth?

Mr. TALBOTT. The Dayton Metal Products property is worth between two and one-half and three million dollars.

Senator REED. Who owns the stock in the Dayton Metal Products Co.?

Mr. TALBOTT. Mr. Kettering and my son and myself.

Senator REED. Did Col. Deeds ever have any interest in it?

Mr. TALBOTT. Yes.

Senator REED. When did he go into the company; at its inception?

Mr. TALBOTT. Yes, sir.

Senator REED. What was his interest?

Mr. TALBOTT. A quarter.

Senator REED. When did he go out of the company?

Mr. TALBOTT. I think in May of last year.

Senator REED. How did he go out; transfer his stock?

Mr. TALBOTT. He sold his stock and transferred it to Mr. Kettering and my son and myself.

Senator REED. And you actually paid him for it?

Mr. TALBOTT. Yes.

Senator REED. How much was paid?

Mr. TALBOTT. I do not remember. The books will show. I think it was about half a million dollars.

Mr. KETTERING. Between \$400,000 and \$500,000.

Senator REED. You used the expression that "another company gets into this." How is this other company connected with these other companies or any of them?

Mr. KETTERING. When the Dayton-Wright Co. decided to go in for this larger business.

Senator REED. That is for the building of fighting planes?

Mr. KETTERING. Yes, sir. Its capital was raised from an original \$200,000 to \$1,000,000 and the Dayton Metal Products Co. stepped in and provided that million dollars.

Senator REED. I see. But I asked a question in regard to it. I am sure I was misled at the time I asked it and I think your answer would be misleading to the question. When you spoke of this other contract I said, "What do you mean? Was it when you enlarged the capital of the Dayton-Wright Co., which was to take on this Government business?"

Mr. KETTERING. Yes, sir.

Senator REED. So that the capital for the Dayton-Wright Co. for this increase to a million dollars was furnished by the Dayton Metal Products Co. When was that furnished?

Mr. KETTERING. That was furnished last spring.

Senator REED. Before or after Col. Deeds sold his stock?

Mr. KETTERING. I have the document here that was requested by the representative of the Department of Justice awhile ago. The representative of the Department of Justice spent three or four days here, and we went through all of the minutes of the various companies and contractors' meetings, and the stock book and stock records, and the organization and capitalization of these companies, and this is all prepared in a sheet. It was prepared by an outside chartered accountant, the manager of Barrow, Wade, Guthrie & Co., of Chicago, and I have sent them a copy of that document. I think that will answer a great many of these questions.

Senator REED. Did this representative of the Department of Justice examine the correspondence that had taken place?

Mr. KETTERING. I do not know. I think the Department of Justice work here was primarily to look through the relationship of Col. Deeds to these companies, and his stock interest and stock bills, and stock ownership.

Senator REED. Did he ask for your correspondence and letters?

Mr. TALBOTT. Not me.

Senator REED. Did he ask you, Mr. Kettering?

Mr. KETTERING. No.

Mr. TALBOTT. I do not know of his doing so. He was a man by the name of Coffey, representing the Department of Justice.

Senator REED. Did any of the stock in this Dayton Metal Products Co. ever appear in Mrs. Deed's name?

Mr. TALBOTT. Never; not to my knowledge.

Senator REED. Was there any kind of an arrangement or agreement or understanding about any of that stock ever being turned back to Col. Deeds?

Mr. TALBOTT. No, sir; absolutely not.

Senator REED. He sold his stock solely because he was connected with this Government?

Mr. TALBOTT. Absolutely.

Senator REED. Did that stock have anything to do with these Government contracts you were about to get?

Mr. TALBOTT. No. At that time we had no Government contracts. The Dayton Metal Products Co. had previously done 12 or 15 million dollars' worth of business for Russia and England and we had finished it and the Dayton Metal Products business was being conducted at a loss, with practically no volume of business in its factories at all when we entered into the war.

Mr. KETTERING. We were designing a line of pumps, refrigerating machines, etc.

Senator REED. You organized that Dayton Metal Products Co. for the purpose of taking Russian and English contracts?

Mr. KETTERING. Yes, sir.

Senator REED. What was it that you were furnishing to Russia and England?

Mr. KETTERING. Detonating fuses.

Senator REED. Is the company doing any of that business now for the Government?

Mr. KETTERING. It is.

Senator REED. When did you get this first contract from our own Government?

Mr. KETTERING. We will get the date, but it was subsequent to Col. Deeds selling his stock in the company. The business amounted to about \$100,000. The United States almost duplicated this Russian fuse. I think they gave us an order for 600,000 or 700,000 detonators. Then they redesigned their detonating fuses, and we are just getting these now.

Senator FRELINGHUYSEN. Can we have your letter files, containing all correspondence with the Government from the beginning of the company up to the date of the letting of the contracts, the files of the Dayton Wright Co.?

Mr. KETTERING. Certainly.

Senator REED. Is there any other company?

Senator FRELINGHUYSEN. I want the correspondence between Col. Deeds, Mr. Coffin, the Aircraft Protection Board, Col. Waldon, Col. Montgomery, Maj. Shepler, and Col. Squier.

Senator REED. Everything relating to the making of contracts.

Mr. TALBOTT. Mr. Kettering and my son and myself are the entire owners of the Dayton Metal Products Co., and, in that way, the entire owners of the Dayton-Wright Co., and also interested in the Dayton Engineering Co., and these plants are scattered. We have another plant at Miamisburg and another on the west side owned by the Dayton-Wright Airplane Co. Our executive offices are in town and we will have to get you the files that are there pertaining to this subject and also those that are here pertaining to this subject.

Senator REED. There are no other companies in any way connected with this company?

Mr. TALBOTT. There is a little company called the Wright Field Co., which will enter into this thing. That was a school company in which we were going to train fliers. This was all before the United States entered the war. We were going to train men in the art of flying, and it was for that purpose, in connection with our building of these sport machines before the war in our little plant over here across the road, and for that purpose we acquired some property right near the city limits of Dayton, and beyond the city, I guess, about a couple of hundred acres. That is the property which the Government subsequently closed up our school on and took over, and is now the McCook field.

Senator REED. What interest did Col. Deeds have in that company?

Mr. TALBOTT. I sent up half an hour ago for a copy of all that detail of dates, amounts, and acreages, and it will be here in 10 or 15 minutes.

Senator FRELINGHUYSEN. Now as to the Wilbur Wright field?

Mr. KETTERING. We have absolutely nothing to do with that.

Senator FRELINGHUYSEN. The Government constructed some building on one of these fields, did they not?

Mr. TALBOTT. A great many on both of them.

Senator FRELINGHUYSEN. What was the name of the contractor, do you remember?

Mr. TALBOTT. The Dayton Lumber Company.

Senator FRELINGHUYSEN. Have you any interest in the Dayton Lumber Company?

Mr. TALBOTT. None whatever.

Senator FRELINGHUYSEN. Mr. King is connected with it?

Mr. TALBOTT. He is president.

Senator FRELINGHUYSEN. Did you finance him in any stage of the game?

Mr. TALBOTT. We helped to finance the Dayton Lumber Manufacturing Co.

Senator FRELINGHUYSEN. They built the buildings?

Mr. TALBOTT. They had a Government contract.

Senator FRELINGHUYSEN. Who furnished them the Government contract, do you know?

Mr. TALBOTT. Col. Deeds and I were in Washington and Col. Deeds, as the leading man in the Miami Valley Conservancy Project, conceived the idea that a large acreage of property lying east of town would be very desirable for a flying field for the Government, and that was presented to the Signal Corps in Washington and they made a lease for—I think, it grew to be nearly 2,000 acres—the Gov-

ernment leased from the Miami Conservancy District and we were asked one day in Washington—I was a member of the Flood Prevention Committee of the City here, in which a fund of a million dollars was raised by donation of citizens to provide a method of preventing a recurrence of these floods. We had had several scares and one very disastrous flood, and we were asked, when that thing was brought about who could build some hangars and buildings in Dayton and Col. Deeds and I consulted on the matter and thought that the largest lumber and planing mill here could very properly build these barracks and hangars and we gave them the name of the Dayton Lumber and Manufacturing Company.

Senator FRELINGHUYSEN. Gave whom the name?

Mr. TALBOTT. Col. Edgar was one of the officers, and, I think, the leading officer having charge of the construction. I remember that we were asked if we could recommend him, and we said that we could, thinking that the amount of business he would do would be within his means, and probably within his immediate capacity in his planing mills and his lumber yards. After recommending him Col. Edgar sent for him and made a contract for him. I am told—I never saw the contract. He started and the project immediately grew to dimensions away beyond his capacity unless he had additional financing, and, as we had recommended him, we undertook to help him with his financing, without a dollar's interest in his contract in any way, shape or manner. Col. Deeds did not, but I endorsed some of his paper and helped him with the banks and the contract was carried through and he has paid back his money.

Senator FRELINGHUYSEN. Were there other contractors in Dayton of good reputation and with sufficient financial credit to have built these buildings.

Mr. TALBOTT. I do not think there were any contractors who could of their own resources; who could have carried on the contract as it grew. It must be ten times as big as it was at the start.

Senator NEW. To what figure did the contract grow?

Mr. KETTENING. I can not tell you that. Here is this correspondence relative to the contracts.

Mr. TALBOTT. Other contractors did a portion of the work there on the Wilbur Wright field.

Senator FRELINGHUYSEN. I asked just the minute that you stepped out, to what amount this building contract grew?

Mr. TALBOT. I do not know, sir. I did not follow into it at all. I should say off-hand that the contract grew to two million dollars.

The CHAIRMAN. From whom did the Government purchase the land, if it did purchase the land?

Mr. TALBOTT. I have never seen any papers, but I understand they leased the land from the Miami Conservancy District.

The CHAIRMAN. I will put that in another way. Did you or Col. Deeds sell or lease at any time to the Government of the United States any lands in, or in the vicinity of Dayton?

Mr. TALBOT. Yes, sir.

The CHAIRMAN. What lands were they?

Mr. TALBOTT. Let me explain. I do not think that Col. Deeds ever leased any land, but you coupled us together. I know of no leases that Col. Deeds ever made to the Government for any land

that he was interested in as an individual, but as the director or chairman of the directors of the Miami Conservancy District, his name may appear on the lease between the Miami Conservancy District and the Government for the Wilbur Wright Field. That is one transaction. I have never seen the papers and have had nothing to do with that. There is one other, and that is this McCook Field, which was the flying field used as a students' field before this country entered into the war.

Senator FRELINGHUYSEN. What was the amount of those leases? What did the Government pay the Conservancy Commission for the lease of this land?

Mr. TALBOTT. I do not know, sir; it will be a very simple matter to get an officer of the Miami Conservancy District to give you that information.

The CHAIRMAN. That is a public organization having for its purpose the prevention of your flood recurrences?

Mr. TALBOTT. Yes, sir.

The CHAIRMAN. Col. Deeds' connection with that was in an official and not in a proprietary capacity?

Mr. TALBOTT. Exactly.

Senator REED. I do not quite understand how a flood prevention committee or organization could have ground to lease. How does that happen?

Mr. TALBOTT. It happens in this way: The flood prevention plan is one of detention reservoirs. In other words, the district has acquired large acreages in the valleys above the dams.

Senator REED. And they had a lot of that ground on hand?

Mr. TALBOTT. They had a lot of that ground on hand.

The CHAIRMAN. And the Government wanted that land?

Mr. TALBOTT. Exactly.

The CHAIRMAN. Col. Deeds's connection with that was because of his official connection with the organization?

Mr. TALBOTT. Exactly.

The CHAIRMAN. And he had no private connection with it?

Mr. TALBOTT. In no way.

Senator FRELINGHUYSEN. Is that land subject to floods?

Mr. TALBOTT. It is estimated by the engineers that at long intervals there might be a few days of back water on this land. I think they estimate once in fifteen or twenty years.

Senator FRELINGHUYSEN. Would a flood render the flying field useless at that time?

Mr. TALBOTT. The buildings and improvements, I understand, have been placed on high ground along the sides of the valley. When the water was backed up on the bottom lands they could not use it for flying, but the records show—the meteorological records show—that that only would occur in February or March, after which time flying in this latitude this last winter was suspended entirely on account of the weather conditions.

Senator REED. I wanted to ask this question? Do you know how much the Government is paying for these leases?

Mr. TALBOTT. No, sir; I have no official connection with the Miami Conservancy District.

Senator REED. Do you know how long they should continue?

Mr. TALBOTT. This is hearsay. I think they terminate the first of July and are subject to renewals.

The CHAIRMAN. Have you had, during your operations here, any instances of sabotage or interferences with production, either directly or indirectly, indicating the existence of any influences here that we know to exist so generally in this country?

Mr. TALBOTT. We have not had anything serious.

The CHAIRMAN. Just what have you had?

Mr. TALBOTT. Practically no labor troubles in the way of strikes. We had a little incipient strike the other day. Our planes piled up in front of the crating gangs and the minute they saw that they wanted an increase in pay. I think that is the only thing that approaches a strike. We paid them off.

The CHAIRMAN. Have you found any defective construction, however small? I notice here on the table a number of rods with broken eyes.

Mr. TALBOTT. Senator, those are some nickel steel pieces we have tested for fracture and found they were faulty.

The CHAIRMAN. I supposed that was the case, but that brought the question up to my mind that I am asking.

Mr. TALBOTT. We had a man come into the plant some time after midnight, into our property north of the present buildings, where some of our lumber is piled, and he was hailed by a guard. He refused to halt and the guard said he would shoot if he did not halt, and the fellow beat him to it and shot the guard through the hand and got away.

Senator NEW. You never found who he was?

Mr. TALBOTT. We never could locate him.

The CHAIRMAN. I take it he was not an employee?

Mr. TALBOTT. I do not think he was.

Senator REED. More than likely he was a common burglar?

Mr. TALBOTT. Yes.

The CHAIRMAN. What is your total working force?

Mr. TALBOTT. We have about 4,000 people.

The CHAIRMAN. What proportion of them are women?

Mr. TALBOTT. Offhand I should say 25 per cent.

The CHAIRMAN. Do you find the work of the women satisfactory?

Mr. TALBOTT. We are very much pleased with it and are very much interested in their work and, as you will see in going through the plant, they are doing some very nice work.

The CHAIRMAN. Do you pay them the same scale of wages as the men?

Mr. TALBOTT. They do not do the same class of work. Their wages would average less than those of the men.

The CHAIRMAN. That is due to the class of work rather than to the fact that they are women?

Mr. TALBOTT. A woman is not as valuable to a factory on account of our State laws limiting the gross number of hours a week that she can work. The advantage in having a man is that he can work longer hours, he can work overtime, and you can not do that with the women. Their hours per week are fixed, and they are very much disturbed about it at present.

The CHAIRMAN. The women are?

Mr. TALBOTT. Yes. They prefer to have the thing open for them.

The CHAIRMAN. They prefer to be free citizens?

Mr. TALBOTT. Yes.

(Whereupon, a recess was taken for lunch and for an inspection of the plant, after which the meeting was resumed at the main office of the company.)

Mr. TALBOTT. We own the property and are subject legally to legal taxes on everything on our property which we own. If we pay the taxes which have been assessed on that property, since the buildings were put on there by the Government, we will pay very largely in excess of our total rental receipts from the Government, and it will leave us not only with no return on our investment, but actually out of pocket, and that is one of the things that we have been accused of profiteering on.

Senator FRELINGHUYSEN. I was looking at it from the Government's standpoint; whether they could not have gotten a level piece of ground at a less rental?

Mr. TALBOTT. Yes; but this was the decision of the Government Board of Army Engineers, who came out there. That field is on a street car line within the city limits of this town, and, therefore, it required no barracks. The transportation was fixed, and paved streets to the field were fixed, and it would save an enormous investment for the men's halls and barracks for the civilian population that they wanted to work in their drafting rooms and machine shops, and I think it is very much more economical than if they had gone very much farther out.

Senator FRELINGHUYSEN. The Government took no option on the property?

Mr. TALBOTT. The Government took no option on the property. They did not ask for it.

Senator FRELINGHUYSEN. Is Mr. Orville Wright living?

Mr. TALBOTT. Oh, yes. He will probably be down here this afternoon. He is the consulting engineer of our company.

Senator NEW. Wilbur Wright is dead?

Mr. TALBOTT. Wilbur Wright is dead.

Senator REED. You have handed us two papers which you have asked be not made generally public, but that the committee is perfectly welcome to the information. We will mark those two papers respectively, "A" and "B." You will permit us to take them, will you?

Mr. TALBOTT. Yes.

Senator REED. You are familiar with these papers and have read them?

Mr. TALBOTT. Yes. I have not read Col. Gage's personal statement, but I have read all I am interested in.

Senator REED. This is a statement by Mr. George C. Smith for the use of Mr. Coffin, and relates to Col. Deeds' personal matters.

Mr. TALBOTT. Yes, sir. I think that everything I am interested in is the Dayton-Wright Co. and the other companies.

Senator REED. They are in the paper marked A. The statements in paper A are true, according to your best knowledge and belief?

Mr. TALBOTT. Yes, sir.

Senator REED. The paper we will mark B relates to Mr. Deeds's personal dealings?

Mr. TALBOTT. I have never read it, Senator.

Senator REED. I will ask you to read this paper B and then ask you when we send back the transcript for correction whether that statement is correct, as far as you know about the transactions?

Mr. TALBOTT. I will do that.

Senator REED. Did you have a statement as to your list of contracts that had been made?

Mr. TALBOTT. No, sir.

Senator REED. You were going to have that?

Mr. TALBOTT. Yes.

Senator FRELINGHUYSEN. Is Mr. Deeds in town or in Washington?

Mr. TALBOTT. I do not know, sir. I think he is in Washington.

Senator REED. Will you please state the contracts according to dates?

Mr. TALBOTT. Senator, there have been a good many changes in the contracts, from the beginning, because they wanted us to get ready to do business and get in shape to turn out airplanes really before they knew just what airplanes they were going to have us build, because, I suppose, after seeing the bunch of men we had in our laboratory over there and how we had performed in contracts of various natures in our manufacturing plants, they had confidence that we could build what they wanted. Here is a copy of an experimental contract.

Senator REED. Is that your earliest contract?

Mr. TALBOTT. No, sir; that is not the earliest. I think the contract we are operating on now is really in Washington being changed. That was a contract for 400 standard J's, 200 De Haviland fours, and 200 De Haviland Nines, I think. Now, they have thrown out the Nines.

Senator REED. There is no date on this contract. This is a January contract. You had contracts filed before that, I think?

Mr. TALBOTT. Yes, sir; we had contracts started last—this refers to 1,500 Martinsydes, which were afterwards canceled, and we were not to build at all. This is the first contract we have finished; 400 standard J's at \$4,130 each. That is finished and gone.

Senator REED. You have just handed me a contract here which you say was prepared by the Government as a contract, and it appears to be dated the 7th day of December, 1917, and calls for 400 standard military airplanes, complete with motors; 2,000 De Haviland No. 9 airplanes, complete, the motors to be completed by the Government; 6,000 De Haviland aeroplanes, complete, the motors to be furnished by the Government; 1,500 Martinsyde aeroplanes, complete, motors to be furnished by the Government; such spare parts for the aeroplanes described as may be ordered by the Government, all in accordance with specifications to be furnished by the Government. Now, what happened to that contract? It was not signed. Was it afterwards canceled, or was the work afterwards performed under it?

Mr. TALBOTT. The work of building the 400 standard J training planes was performed under that contract. The Signal Corps later decided they wanted us to build the De Haviland fours instead of the De Haviland Nines.

Senator REED. Do you know what that was?

Mr. TALBOTT. The drawings and models for the De Haviland Fours arrived in this country, but the model and drawings for the De Haviland Nines had to come from England.

Senator REED. So you got into production quicker?

Mr. TALBOTT. We got into production quicker.

Senator REED. What happened to the 1,500 Martinsydes?

Mr. TALBOTT. They were canceled.

Senator REED. Do you know why?

Mr. TALBOTT. I do not know except that the Government told us that they preferred more of the De Haviland Fours after they saw them fly, which they did on our fields, from our own manufactured machine, on the 29th day of October.

Senator REED. What other contracts have you since made?

Mr. TALBOTT. We have a contract for experimental work.

Senator REED. And that contract for experimental work is dated the 25th day of January, 1918. Is that right.

Mr. TALBOTT. Yes.

Senator REED. And you are proceeding under this experimental contract?

Mr. TALBOTT. Yes, sir.

Senator REED. And it includes some work that is secret as well as some that is not secret?

Mr. TALBOTT. Yes, sir.

Senator REED. And it is a cost plus contract?

Mr. TALBOTT. Yes, sir. The south field which consists of about 120 acres belonging to Col. Deeds, who leased it to our company for \$1 a year, and the Government is getting the benefit of it in that way without charge. Our company put up the buildings.

Senator REED. What contract have you for planes?

Mr. TALBOTT. No others, sir.

Senator REED. You are still working on what?

Mr. TALBOTT. On 4,000 De Haviland Fours. That is the contract that is still in transit between here and Washington. That is the final copy.

Senator REED. That you have not received yet?

Mr. TALBOTT. That we have not received yet.

Senator REED. I do not think you have yet shown the contract for the 4,000 De Haviland Fours but you have such a contract, and that is sufficient?

Mr. TALBOTT. Yes, sir.

Senator REED. What, if any, delays have you suffered by reason of the failure of the Government to promptly furnish you with information, drawings, models, or other things that you had to have in order to proceed?

Mr. TALBOTT. We have been delayed by lack of information and by lack of being furnished the accessory parts which the Signal Corps reserve to themselves to furnish the manufacturer, including the Liberty motor.

Senator REED. How long were you delayed for want of Liberty motors?

Mr. TALBOTT. I think it might be well to say that the Liberty motor got into production and I think was finished and tried out in a pretty short time. The other delays might not have made an earlier

date of delivery of the finished machines. The motor itself was the governing feature.

Senator REED. I do not quite get the force of that statement, I am afraid. Do you mean to say that—

Mr. TALBOTT. That if we had had all these other things—the guns and gun mounts and a lot of other things—we would still have had to wait for the Liberty motors for the final delivery of the planes.

Mr. KETTERING. We did not have to wait for the Liberty motor because of other delays that were greater.

Senator REED. What were those other delays?

Mr. KETTERING. I would like to state some engineering history on this thing. We were first to build the 400 training machines, and in that 400 we were first to build the Curtiss, and the Curtiss machine had not been fitted with the 400 Scott-Hall engine; it was changed from the Curtiss to the Standard, and after the Standard machine arrived in Dayton with what were supposed to be complete drawings, we found on analyzing those drawings that they were very incomplete and on the flying field they were having much trouble with this Standard machine. We found it necessary to make a good many changes in the Standard machine and make our own drawings for the machine, and we made changes in the landing gear and the gasoline system and a whole stack of that kind of stuff, but it took not so long to make the changes as to get the Army officials at Washington to O. K. those changes. We finally got into production and built those 400 machines. Last August this De Haviland was sent over with some drawings to America. By that we mean this: It was all English, and there is a list of things, and we had to translate all that stuff into American terms so our men would know what it all meant. In addition, we had to mount the Liberty motor in that plane, and we had that mounted and got the Liberty plane in the air in October, and that plane is almost as you saw it this morning. We did not have the machine gun, but we had a great many of the other things. About that time word was received from the other side that they did not want us to build these De Haviland fours at all; that a new machine known as the De Haviland nine had come out over there and that it was very much better, and that a machine and drawings were being sent over.

Senator REED. That is last October?

Mr. KETTERING. Yes. Then Col. Clark came over with a set of drawings for the De Haviland nine, and we had them over in this office and checked them over one afternoon, Mr. Schoonmacher and myself, and found with our experience with the De Haviland we could easily see what the trend of the thing was, and we have built an experimental De Haviland nine at the south field, where we were this morning. There were two things in that machine which were undetermined. One was the location of the radiator and the other was the armament. We recommended that we put the radiator up in the nose in the same place as on the De Haviland fours, and we proceeded along that line and had that machine ready for flight about the 1st of December, but we could get no determination on armament or machine gun mounting or anything. We had been trying since last December to get definite information on these accessories, and I had been to Washington once to try to get the machine guns, etc. About

that time we saw that if we were ever to manufacture the De Haviland Nine it would be at least three or four months delayed, because a great many of the fundamental things, such as the balance of the machine, could not be determined until we had a great many of these other things. We had already determined the balance on the Four but not on the Nine. We recommended to Washington that they let us build a thousand of these De Haviland Fours. This will account for the variation in the contracts. They said, "You can build a thousand De Haviland fours." We put the engineers back on the De Haviland fours and started to prepare drawings, and a bunch of men were sent down from Washington to assist on that machine-gun work. These men had never had any experience in experimental work and there was quite a delay in getting those machine guns on, and after we had got one machine gun in front and one in the rear and other accessories were determined, Col. Waldon came back, as we understood, about that time from the other side, and recommended that two machine guns go on.

Senator REED. Where does Col. Waldon reside?

Mr. TALBOTT. In Detroit.

Mr. KETTERING. That two machine guns go on the front and two in the rear, and quite a number of other accessories. The Government men sent a production engineering man here, to clear up this De Haviland Four, and they made many claims that the machine guns were ejecting shells, many of which were imperfect, and we fooled along from January to February to straighten this thing up and could not. Finally Mr. Potter and others came from Washington and we told them they would have to get somebody here who had practical sense on this thing.

Senator REED. He has some practical sense?

Mr. KETTERING. He is a very good man. I have known him a good many years. I have worked with him and built special apparatus with him when he was in San Francisco, for motor cars to run on street railways. We took some men on the south field and we cleaned it up, and we had the ship we went on this morning.

Senator REED. When you say you cleaned up you mean the machine is complete?

Mr. KETTERING. Yes. We got the go ahead on that on April 8.

Senator REED. On this order? One year and three days after war was declared?

Mr. KETTERING. Yes. We could have manufactured machines which would have been good machines back in December, and I put this question up to these men several times. I said, "Supposing we could let you have a machine like this, what would you give for them?" and they said, "Almost anything you would ask." Then I said, "Why not build those machines?" They were not the last word in machines. There was confusion in here.

Other manufacturers got to saying that you could not get information from the Dayton-Wright people relative to what these machine were to be, and we got a good deal of criticism on that and finally Maj. Gray came to our plant one morning, and he said, "I am going to have something for you to answer this morning. Why could you not get out the drawings?" I said, "We are trimming 40,000 yards

of blue-print paper per day and we get all the orders for blue prints, etc., that they want in Washington," and up to that time we had requisitions for drawings that would have taken us 40 months to print at 40,000 yards a day.

Senator REED. Why was the demand made on you?

Mr. KETTERING. It takes 31 copies of a drawing to follow out the routine to get a piece in the factory. There were half a dozen factories, and these enormous government departments all had to have a complete set of drawings—one set to every desk—and there were hundreds and hundreds of sets of those drawings, and something like 2,200 drawings in a set for one machine, and you can duplicate 40,000 and get a terrible mass. We began to make negatives so that when the factory got one set of negatives they could make as many copies as they needed.

Senator REED. Why did not somebody think about that negative proposition earlier?

Mr. KETTERING. We did. We proposed a good deal of this stuff, but anything we proposed at that time was taken antagonistically.

Senator REED. It was proposed by you to the Army officers and they turned it down.

Mr. KETTERING. Yes. The thing got pretty bad at one time and any suggestion which we offered was just kind of thrown over. I will say this, that our delays were brought about a great deal by a lack of understanding on the part of the Government officials here as to what constituted a proper design of an airplane, as to what was necessary to go on, whether that lack of information was due to their not understanding it or not having it. The machine gun and bomb-dropping devices, as I understood, were supplied by the Ordnance Department, and we have not yet got what I would consider a high-grade bomb-dropping device.

The CHAIRMAN. Could you device one?

Mr. KETTERING. We could for the matter of simply dropping bombs, if that was all that was to be considered, but it is one of those things which has been made mysterious; the common, ordinary engineer is not supposed to understand it.

The CHAIRMAN. What do you mean by that?

Mr. KETTERING. Every time we make a suggestion on this, they say, "The reason it will not work is so and so."

The CHAIRMAN. Some information which has not been confided to you?

Mr. KETTERING. Yes. If it is simply a matter of functioning, as we see these things function now, we could design one, but since these men have designed this first bomb-dropping device they have seen the difficulties of installing them on planes. The Ordnance Department is making improvements on those very same jobs and I think they are getting out of the difficulty all right.

The CHAIRMAN. Have the mechanical engineers of this country been called upon to produce improvements on these machine and on the engines and on the parts?

Mr. KETTERING. No.

The CHAIRMAN. They have not been?

Mr. KETTERING. No.

The CHAIRMAN. You have had how many years' experience in manufacturing?

Mr. KETTERING. I have had about 13 or 14 years.

The CHAIRMAN. Are you the inventor of the Delco ignition system?

Mr. KETTERING. Yes.

The CHAIRMAN. What other things?

Mr. KETTERING. Much of the electrical equipment used by the National Cash Register Co., and I designed some of their machines, and I am the engineering head of the Delco Co. and the Domestic Engineering Co., and I have been working with Mr. Talbott and his son on these other industries as an engineer.

The CHAIRMAN. I want to ask you whether, in your judgment, if the engineers of the country are called upon to make improvements, or suggest improvements, and particularly the engineers who are working with the airplanes and with the engines and the bomb-dropping devices, it would be likely to produce good results?

Mr. KETTERING. Yes. One man's idea does not amount to much in this world. Let me explain why. Every piece of machinery is just about 50 per cent machinery and 50 per cent psychology. To illustrate that, the size of this house and this door are the size that they are because of the average size of a man. A great many of us see an improvement that looks like a good mechanical improvement, but it is not good because it interferes with the fellow who has to take hold of it. The great difficulty is that not enough people understand the aviation problem. We are going to have a meeting here in Dayton on the 17th and 18th of this month which is the midsummer meeting of automotive engineers, and we will have about 1,500 of the best engineers in this country on motors, airplanes, and trucks, and all that sort of thing; also motor cars; and we are now trying to get an exhibition of the various foreign motors and airplanes, and our Liberty motor, and all those things, so that these engineers can see that stuff and get a conception of this airplane program so that they can use their judgment and talent on a system of development of this apparatus.

The CHAIRMAN. As long as the improvement is confined to the inventive genius that may happen to be connected with the Government, improvement is to just that extent circumscribed?

Mr. KETTERING. Yes; it had to be.

The CHAIRMAN. That is, it is circumscribed in just that proportion as the number of men that happen to work in the technical department of the Government bears to the total number of good engineers in the United States.

Mr. KETTERING. Mr. Gearing is president of the Automotive Society of the United States. You gentlemen could help us. The manufacturers are going to send us some of their new trucks and motors, and we are asking for some Liberty motors and Liberty motor parts so that these men can see this stuff, and we have not yet received permission from Washington. It would be the greatest mistake not to show these men the Liberty motor, and we would like to put a Liberty motor stand up there and let these men see a Liberty motor run. It can not hurt any thing and can only do good.

Senator REED. Whom have you applied to?

Mr. KETTERING. Through Mr. Potter.

The CHAIRMAN. Might the description in Senator Reed's last statement be attributed to Gen. Miles of the Ordnance Bureau some years ago? He said:

Its proper purpose was to furnish the American Army with the best practical equipment that would be up-to-date, but instead of performing that function they had long ago resolved themselves into a board of competition with the inventive genius of the world.

Mr. KETTERING. Yes. By getting more people to understand this thing, just as in the motor car industry it was the outsider that helped to make the motor car, and the salesman. You fellows helped to change and improve the motor car. That is the way to get the best out of this country.

The CHAIRMAN. Have you gentlemen any other suggestions as to any better way to push on the matter of improvement than you have just mentioned?

Mr. TALBOTT. We feel that if there was, perhaps, more put up to the manufacturer, we would get better results, if the manufacturer was given a freer hand.

The CHAIRMAN. Are you not liable to run into the proposition of destroying standardization and getting machines of many different sizes?

Mr. KETTERING. No. For instance, we have the nicest example in the world. It would have meant failure for us to have gone to work on this air speed indicator and tried to sell it to the Government. So we got it up and got Col. Vincent and Maj. Hall to come down here to see it and they said it looked good, and we tried it out and they saw it day before yesterday, and now to-day it is on a plane being flown to Indianapolis and back. We want to make that indicator for them. When we first proposed to make an air speed indicator, they said that it would not work, but we showed them that it would work. It is called a taximeter. Let us get those fellows from Washington down and have a little conference and decide to make half a dozen more experimental instruments. When that comes through it will be consistent and fit on everything else. I do not believe in our going to work and letting each fellow make any ramshackle thing he wants.

The CHAIRMAN. What do you think of the practicability of putting in some sort of armor plate protection; building a machine with armor plate protection for aviators?

Mr. KETTERING. For certain classes of machines I think that is perfectly feasible and practicable.

The CHAIRMAN. For what classes?

Mr. KETTERING. This trench fighter class, where they fight low over the trenches.

The CHAIRMAN. With a large, heavy machine, and slow movement?

Mr. KETTERING. Not very slow, 175 or 190 miles an hour.

The CHAIRMAN. Why is that not done?

Mr. KETTERING. I do not know.

The CHAIRMAN. Do you think you could get up that thing if given the order?

Mr. KETTERING. We proposed that thing some months ago. We wrote to Mr. Kellogg. He is Mr. Potter's assistant.

The CHAIRMAN. If you had a go-ahead order to try and get up one of those planes, do you believe that you could produce one?

Mr. KETTERING. Yes, but what we would do would be to work with the boys in the McCook field, so that when this thing came through it would not be an outlawed thing because a lot of the things did not fit in.

The CHAIRMAN. Who are the boys in the McCook Field?

Mr. KETTERING. The aviation heads in the Army.

The CHAIRMAN. You wrote a letter of that kind and never got any encouragement.

Mr. KETTERING. We got a reply Monday of this week from the McCook Field saying that they were considering such a machine.

The CHAIRMAN. When did you write the letter?

Mr. KETTERING. About three or four weeks ago. About two weeks ago we got a letter from Mr. Kellogg asking us to briefly outline what such a machine would be.

The CHAIRMAN. Have you done that?

Mr. KETTERING. Yes, and we got a reply from Col. Vincent saying that they had a machine under consideration and they would not want to discuss ours.

The CHAIRMAN. You are working nine hours a day?

Mr. KETTERING. Some departments are working all night. We keep the plant running almost 24 hours.

The CHAIRMAN. When you get really into production your capacity will be about 500 planes a month?

Mr. KETTERING. Yes.

The CHAIRMAN. And you expect to reach that about when?

Mr. KETTERING. In 60 to 90 days as a maximum.

The CHAIRMAN. And you have 4,000 planes to make on this order?

Mr. KETTERING. Yes, sir.

The CHAIRMAN. And you have already shipped how many?

Mr. KETTERING. About 240 or 250.

The CHAIRMAN. How many do you expect to get out this month?

Mr. KETTERING. 375.

The CHAIRMAN. You then will speedily exhaust that 4,000 order that you have?

Mr. KETTERING. Yes.

The CHAIRMAN. And you have no additional order coming on?

Mr. KETTERING. No, sir.

The CHAIRMAN. If you do not get additional orders it will be very disastrous to your organization and your plant?

Mr. KETTERING. We will have to stop.

The CHAIRMAN. And if you do not get that order pretty soon you will have to slow down?

Mr. KETTERING. We will run up to the limit up to the time we have to stop.

The CHAIRMAN. How much of an order would you have to have so as to keep your plant running straight along at full capacity without any interference?

Mr. KETTERING. If it is a new ship, we would want six months.

The CHAIRMAN. If it was this same ship, how much time would you want?

Mr. KETTERING. Three or four months. The thing that I have in mind now is: We feel that a slight redesign of this present ship can make it into a very wonderful airplane. We have no interest in this airplane. It was just handed to us to design, but I have studied the airplane subject and we know of no other machine driven in the world today that is as good an all-around airplane as we have got.

The CHAIRMAN. You have never seen the "9?"

Mr. KETTERING. Yes; they have one at the McCook Field. It is more of a bombing machine and is heavier. This machine by slight changes will make a wonderful two-passenger fighting machine.

The CHAIRMAN. Have you asked for authority?

Mr. KETTERING. I will explain that.

I have talked about that thing, and the other day Col. Vincent and Maj. Hall were here for lunch and they brought over some drawings for a redesign of the fuselage. It is not an original design in this machine. The pilot sits under the wings, and the observer away back. There is quite a space between and we are going to transpose the gas tank so as to bring these two men closer together. I believe we can make that machine a 140-a-mile-an-hour machine without radical changes, and we have agreed to build two of those machines on an order issued by the McCook field, and it would not take a great length of time. If such a machine as that were adopted it would not take us long to make such changes in our plan as would be necessary to get it into production. It is the consensus of opinion of the designers over there that we had very much better improve the types of machines we have got rather than design some new machines which theoretically would be better than the ones we have.

The CHAIRMAN. But you think it would take much more time?

Mr. KETTERING. Yes. Do not take me to say that we could not be designing these machines. We should, but we ought to be working them out.

The CHAIRMAN. That is to say, you ought now to be working on a new machine for next year, and possibly for the next year after that?

Mr. KETTERING. Yes.

The CHAIRMAN. In producing an experimental machine to follow your production upon the approved machine?

Mr. KETTERING. Yes.

The CHAIRMAN. You need more orders now?

Senator FRELINGHUYSEN. In connection with the designing of airplanes and making studies of air planes should you not have the working drawings and models of all engines that the Government intends to adopt?

Mr. KETTERING. Yes; I think we should. That is a strong point. We should at least have drawings, weights and that kind of stuff.

Senator FRELINGHUYSEN. In other words, there should be a unification of information?

Mr. KETTERING. Yes. We were working down in a well and could just see the sky above.

Senator REED. You now need additional orders?

Mr. KETTERING. We do not need the orders so much right now as to know about what type of thing we are to do next year, because that will help us to formulate our plans.

Mr. TALBOTT. If they wanted us to build a type of Caproni machine, to commence on the first of January, we would have to know this month.

Mr. KETTERING. If it was anything radical we would want our sample now, to go all over it and get ready for manufacturing it.

The CHAIRMAN. I would like to ask you particularly whether you can give us any idea about the relation of engine production to machine production. It seems to me from what I have observed on this trip that we may have a surplus of engine over plane production?

Mr. KETTERING. As I understand it, there is no question in my mind but what there is going to be a surplus of Liberty motors over planes here, but here is another thing to take into consideration. Two or three of the very important members of the Society of Aeronautical Engineers were over on the other side and spent three months there and just got back three or four months ago and say that England has hundreds of planes standing over there waiting for motors and they are designed to take Liberty motors, and I understand they have planned to handle our Liberty motors and our plan is to supply the allies with this engine.

The CHAIRMAN. Do you think that idea of supplying the allies comprises our production of the Hispano-Suiza also?

Mr. KETTERING. I understood that some of them will.

The CHAIRMAN. Then, the possible surplus of Liberty engine production may be absorbed by the Allied Nations?

Mr. KETTERING. Yes.

The CHAIRMAN. Were you gentlemen concerned at the outset in any way in what is known as the Cross license agreement?

Mr. KETTERING. Only as we were asked to go down and become members of this Aircraft Manufacturers' Association.

The CHAIRMAN. Your name is the Dayton-Wright Co.?

Mr. KETTERING. Yes.

The CHAIRMAN. Is there any of the royalty that is controlled by the Wright-Martin people provided for in that agreement that comes to—

Mr. KETTERING. No.

The CHAIRMAN. You say you were asked to sign that agreement. Who requested you to do so?

Mr. KETTERING. We have the records on that and we absolutely refused to pay a cent in on that Cross licensing agreement, until we had written authority and instructions from the Signal Corps to do so.

The CHAIRMAN. Will you let us have copies of that?

Mr. KETTERING. Yes, sir; certainly.

Senator REED. And please make those copies absolutely complete. I mean by that, do not omit any part of the correspondence in preliminary letters, or anything of that sort.

Mr. KETTERING. We know what you want. You want the story.

Senator REED. Is the royalty or contribution which you are required to pay included in the cost of production?

Mr. KETTERING. Yes, sir. I understand it is \$250. I think it has been reduced.

Senator REED. You had to pay a thousand dollars to join the Manufacturers Association, did you not?

Mr. KETTERING. I think so.

Senator REED. Is that also included in cost of production?

Mr. KETTERING. I could not say. I do not think so.

Senator REED. Then I can sum it up, can I not, in this statement, that if you had been permitted to exercise your own volition, you would not have signed it under any circumstances?

Mr. KETTERING. No; that is hardly correct, but we said when that was put up to us that we were working for the Government and it was not our affair and they will settle it with the Government and settle it with the Signal Corps, and we would do what the Signal Corps ordered us to do.

Senator REED. And they took it up with the Signal Corps?

Mr. KETTERING. Yes.

Senator REED. Who are they?

Mr. KETTERING. The Cross Licensing Association.

Senator FRELINGHUYSEN. Who does that royalty go to?

Mr. KETTERING. To the people who own the patents. Here is the way I have also looked at that Cross licensing agreement: It is only fair that these men who did this work should get some compensation.

The CHAIRMAN. Precisely. There is no dispute between us about that. I think that the Government should have bought those patents or commandeered the patents and have settled the question as to who should pay for the patents?

Mr. KETTERING. Yes. But we feel that the Government should deal with those men instead of our dealing with them.

Senator FRELINGHUYSEN. The Dayton Metal Products Co. was organized on the 25th day of April, 1915, was it not?

Mr. KETTERING. I think that is the date, yes.

Senator FRELINGHUYSEN. That is according to this document which I have marked "A." Mr. E. A. Deeds at that time owned 500 shares.

Mr. KETTERING. Yes, sir.

Senator FRELINGHUYSEN. Up to the time of the organization of the Dayton-Wright Airplane Co. he owned 500 shares, did he not?

Mr. KETTERING. Yes, sir. I do not know the date he sold, but practically at that time.

Senator FRELINGHUYSEN. He sold those shares to you at a computed price, which amount was to Mr. H. E. Talbott, \$250,492.87; to Mr. C. F. Kettering, \$273,492.86; to H. E. Talbott, jr., \$136,746.43; for which you gave him your personal notes?

Mr. KETTERING. Yes, sir.

Senator FRELINGHUYSEN. For a term of one year, carrying 6 per cent interest, did you not?

Mr. KETTERING. Yes; that is the record as to the amount. The transaction is correct.

Senator FRELINGHUYSEN. Did you give Col. Deeds collateral to secure those notes?

Mr. KETTERING. I did not.

Senator FRELINGHUYSEN. Is there any provision in the notes that in default the stock shall be returned to him?

Mr. KETTERING. There is not.

Senator FRELINGHUYSEN. Subsequent to this sale the Dayton Metal Products Co. came into control of the Dayton-Wright Airplane Co., did they not?

Mr. KETTERING. They did.

Senator FRELINGHUYSEN. And they now hold 5,595 shares out of 6,000?

Mr. KETTERING. Of one class of stock.

Senator FRELINGHUYSEN. Of the common stock?

Mr. KETTERING. Yes, sir.

Senator FRELINGHUYSEN. Which controls the company?

Mr. KETTERING. Yes, sir. They also own all of the preferred stock.

Senator FRELINGHUYSEN. Has there been any private or secret contract or agreement between you and Col. Deeds to return or resell the stock to him at some future date?

Mr. TALBOTT. No, sir; there has not.

Mr. KETTERING. Absolutely not. When that sale was determined we employed an outside certified accountant to go through the books and determine the value. We both agreed to sell and buy on his results.

Senator FRELINGHUYSEN. It is so unusual an agreement, probably by reason of the fact that the war came so quickly, it had to be so hastily done that naturally we ought to go into the record accurately.

Mr. KETTERING. Yes, sir. You can see very readily why we did not want Col. Deeds to sell his stock to anybody else, because we have such a close corporation on it.

Senator REED. When we were going out to the field, you were talking with us about what you had said to the Government officers at the time they were drawing up the first of these long contracts for the making of aeroplanes; as to the proposition you made them of writing a certain clause into the contract, and they could write all the rest of it.

Mr. KETTERING. Our attitude on that matter at that time was that we were pleased to undertake this whole matter of building airplanes for the Government in such quantity as they needed, as far as we were able to, and our prime requisite in the contract was that we should not lose money rather than we should make any profits that might accrue.

Senator REED. Did you then make the proposition that if they should write into the contract that they would make good to you the amount of money you actually expended, that you were willing to make airplanes for them without any profit whatever?

Mr. KETTERING. Not exactly that, but the statement that you made is one that we made. The conclusion was that they could write all the rest of the contract; they could determine everything else.

Senator REED. That is, if they would agree to make good to you, to hold you free from loss, they could put anything else into the contract they wanted to put in?

Mr. TALBOTT. Yes. They could determine the profits and everything else.

Senator REED. In other words, you were practically willing to accommodate——

Mr. TALBOTT. Whatever they considered, it was all right to us.

Senator REED. What is your opinion of the Liberty motor?

Mr. KETTERING. I think the Liberty motor is a most excellent motor. I do not know of any better engine built to-day than the Liberty motor. It is like any new piece of apparatus. There are

little difficulties that are gradually worked out of the motor as you manufacture.

Senator REED. The sump drain plug has been criticized as being an unsafe device.

Mr. KETTERING. Senator, I would put a screw plug on there and get that thing off. Not that the thing that is on there is not good, but what is the use of having the big, major part of that motor condemned and criticized because of a little insignificant detail like that.

Senator FRELINGHUYSEN. Do you think that it is a dangerous device?

Mr. KETTERING. I have never had anything happen to it.

Senator FRELINGHUYSEN. If anything does happen is it dangerous?

Mr. KETTERING. You lose your oil and stop your motor, and you might have that if you screw the plug in. I would not go on record as saying that a screw plug is any better.

Senator FRELINGHUYSEN. Do you mean to put a screw on it that absolutely would not unscrew?

Mr. KETTERING. Yes, you can lock it on. If I was designing that thing I would change it because of the psychology of the thing. If you analyze the Liberty motor, part by part, it is an awfully good job. That is why I say I would like to get suggestions from thousands of engineers.

Senator FRELINGHUYSEN. The manufacture of the Liberty motor has been criticized in that the cylinders are delicate and thin.

Mr. KETTERING. Of course, every aviation motor has to be in order to get light weight.

Senator FRELINGHUYSEN. They are not thinner than usual?

Mr. KETTERING. Our manufacturers go at this with a great production drive, where they change the design to increase the manufacture.

Senator FRELINGHUYSEN. Another criticism made is that one of the connections on the top of the water jacket, a flange underneath, is apt to loosen and the water jacket leak. Have you observed that?

Mr. KETTERING. I have never had any trouble with those.

Senator FRELINGHUYSEN. Another objection is that the bearings as constructed are apt to burn out.

Mr. KETTERING. We had a little trouble with that because the bearing was a little light at first, but the heavier bearings are now coming through.

Senator FRELINGHUYSEN. I notice that the Rolls-Royce bearings are white metal. Do they differ?

Mr. KETTERING. Not necessarily.

Senator FRELINGHUYSEN. Are the Rolls-Royce bearings better than the Liberty motor bearings?

Mr. KETTERING. I would not say so.

The CHAIRMAN. Are the salaries of the managers and officers of your corporation a part of the production cost, and used as a basis of the percentage on these orders?

Mr. KETTERING. Our contracts are made with a bogie price. In the Standard it was \$4,130 per finished machine. We received a fixed sum of profit for building those machines. That is a fixed sum; it is not a percentage. It is figured from a reasonable percentage, and when that sum is fixed, I think it is 12½ per cent. Now, if you save \$100 on the cost of the machine, the Government gets

\$75 of it and we get \$25. That was developed as an additional incentive for economy and an incentive to keep the cost as low as possible, but in that cost our salaries are included. It has nothing to do with the fixed profit we make on a machine, but it has to do with the percentage that we may gain in addition to the fixed profit, by reducing the cost and only in that way.

Senator FRELINGHUYSEN. What percentage do you figure your overhead for salaries.

Mr. TALBOTT. I do not know.

Senator FRELINGHUYSEN. You will permit me to ask the question in another way. What is the total amount of contracts you have at the present time?

Mr. TALBOTT. With what we have done and have to do, I think \$26,000,000 or \$27,000,000.

Senator FRELINGHUYSEN. Take the year 1917; what were your contracts? In the year 1917, what was the percentage of overhead for officers' salaries, and the percentage for employees, and the same for 1918? You can answer that question when we send you a copy of these statements to go over.

Mr. KETTERING. I strongly recommend that companies manufacturing the Liberty motor be permitted and encouraged to set up an engine on the side embodying any features they consider improvements upon the regular type of Liberty motor they are producing, and upon which they may freely experiment, such engine to be submitted to the Signal Corps for inspection and approval from time to time.

The CHAIRMAN. If necessary, you can double the production of airplanes in your plant?

Mr. KETTERING. Yes, we could.

(Whereupon, the committee adjourned to meet at the call of the chairman.)

STATEMENT OF SENATOR NEW CONCERNING THE PRODUCTION OF LIBERTY MOTORS AT THE NORDYKE & MARMON PLANT AT INDIANAPOLIS.

By arrangement with Chairman Thomas, of the subcommittee, I went from Dayton to Indianapolis on the evening of June 7, 1918, for the purpose of making an inspection of the Nordyke & Marmon plant in the last-named city. I went to the plant early on the morning of Saturday, June 8, and spent the entire forenoon in going over the shops, inspecting tools and products, and in interviewing the members of the firm and production managers.

I found that the company had been very greatly embarrassed, and their work seriously retarded through their inability to receive deliveries of tools at an early date, but this embarrassment had been overcome and the plant is now ready to begin early deliveries.

It employs in the department which has been given over to the production of Liberty motors about 1,600 men and women, probably 25 per cent of them being women. The company at the present time has one contract for 3,000 Liberty motors.

Following a trip through the plant with Mr. Walter Marmon, president of the company, I had an interview with Mr. Marmon, Mr. F. E. Muscovics, Mr. Schrader, production manager, and other

officers of the company. In reply to my queries as to what had retarded delivery of this motor order, Mr. Marmon replied that, in the first place, the terms of the contract as to deliveries were impossible, and he said that the company feared this at the time the contract was entered into, but that they were finally influenced into accepting dates, practically upon the assurance by the Government that jigs, tools, etc., would be delivered very promptly; and partly by the fact that the other manufacturers who were given contracts about the same time, also agreed to those dates, Mr. Marmon feeling that if the others could conform to them his firm could do likewise.

Mr. Marmon also said that previous to their acceptance of their contract for the Liberty motors the firm had been employed on a contract for 1,000 Hall-Scott motors, this having been completed within the time limit, the last deliveries having been made April 20, 1918, to different fields and warehouses as the Government directed. These Hall-Scott motors are used in planes of the Standard J type. The possession of this contract was found to interfere with the inauguration of the work on Liberty motors to a much greater degree than had been anticipated by the firm, and played an important part in the retardation of their program. Mr. Marmon also said that one of their greatest difficulties was occasioned by interference by the Government itself, particularly the Ordnance Department, in stopping workmen who were making tools for the Nordyke & Marmon Co., the work of these men being diverted to the making of other tools and appliances required by the Government for other manufacturing operations.

The firm had 65 different shops making jigs and tools for them before they finally succeeded in getting their equipment.

It was also necessary to put up new buildings, the entire work of preparation requiring much more time than had been anticipated when the contract was entered into.

Deliveries of Liberty motors were to have been made as follows: January, 25; February, 125; March, 550; April, 700; May, 800; and June, 800. The present expectation of the firm is for deliveries as follows: June, 11; July, 114; August, 360; September, 500; October, 568; November 535; December 522; and January, 1919, 390.

The firm gets its motor castings from the J. C. Brill Co., Philadelphia, it being the only firm obtaining castings from this source.

When I asked whether any instances of sabotage had occurred in the plant, Mr. Marmon replied that there had been two or three suspected instances, none of which was serious or extensive. He spoke in the highest terms of the character of the work done by the women employed in the work, and I was most favorably impressed by that myself, as, indeed, in common with the others members of the subcommittee at all the shops previously inspected.

The other gentlemen mentioned as having been present concurred in all that Mr. Marmon had said, and participated in the conversation.

The equipment of the plant appears at this time to be complete and of excellent character, and the appearance and discipline of the employees is excellent.

AIRCRAFT PRODUCTION.

TUESDAY, JUNE 18, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Princeton, N. J.

The committee met in the office of the president of Princeton University, Princeton, N. J., Hon. Harry S. New presiding.

Present: Senators New, Frelinghuysen, and Smith.

STATEMENT OF MR. JOHN GRIER HIBBEN, PRESIDENT OF PRINCETON UNIVERSITY.

Senator FRELINGHUYSEN. What is the name of the school?

Mr. HIBBEN. United States School of Military Aeronautics, Princeton University.

Senator FRELINGHUYSEN. Do you happen to know whether there are many more schools of this character established?

Mr. HIBBEN. There are, altogether, I think, five at the present time. There were originally eight.

Senator FRELINGHUYSEN. How many students are there?

Mr. HIBBEN. At the present time 700.

Senator FRELINGHUYSEN. Is that the maximum number?

Mr. HIBBEN. I think that is. I will ask Mr. Wintringer to answer that question.

Mr. WINTRINGER. The course was increased from 8 to 12 weeks' duration. At the present time we are operating with classes of 75 men, making a maximum enrollment of 900. At the present time, however, there are only 700 in the school. The maximum has not yet been reached. They expect to reach it on July 13, but really that will never be reached, because that is a theoretical maximum. The numbers of discharges and transfers range from 20 to 30 per cent, so that we figure the enrollment will be between 700 and 750 at the outside.

Senator FRELINGHUYSEN. What is the nature of the instruction?

Mr. WINTRINGER. There are seven courses. The departments are as follows: Department of military studies, department of gunnery, department of aids to flight, department of airplanes, department of engines, department of observation, and department of military instruction.

Senator FRELINGHUYSEN. That is all, is it not?

Mr. WINTRINGER. Yes, sir.

Senator FRELINGHUYSEN. How are the men assigned for instruction? Are they sent here from the Government?

Mr. WINTRINGER. The men are sent here from the Government. The university is concerned only with giving the instruction; that is, the theoretical instruction. The military instruction is directly under the Government.

Senator SMITH. They keep a representative of the Signal Service, a commandant in charge?

Mr. WINTRINGER. Yes, sir. He has certain subordinates, some of whom take direct charge of the military instruction, and the barracks and the military discipline is maintained by these men. The university simply supplies the theoretical instruction.

Senator SMITH. All you supply is the instruction and location?

Mr. WINTRINGER. Yes; and all the equipment. We furnish everything that they have to use in their equipment, except airplanes and the engines, which the Government has supplied. All the other equipment is supplied by us. For instance, the rigging up of the room for gunnery. I omitted to mention gunnery, by the way. They supply the guns, but we rig up all the laboratories, and we have rigged up a miniature range for aerial observation work. Equipment of that kind is supplied by us on requisition by the commandant.

Senator SMITH. How are the men rationed?

Mr. WINTRINGER. At the university dining halls, at which they are charged \$1 per day. The Government allowance is paid to the men and the men in turn pay that to us.

Senator SMITH. How many men have you received in the school?

Mr. WINTRINGER. To date?

Senator SMITH. Yes.

Mr. WINTRINGER. The total figure I can not give you offhand, but we have been operating now about 48 weeks. We started the 3d of July. It is somewhere between 1,500 and 2,000. I could not give the exact figures. If you wish it, they can be supplied to you.

Senator SMITH. Then you have practically graduated 800 men?

Mr. WINTRINGER. Yes, sir.

Senator SMITH. Where do they go from here?

Mr. WINTRINGER. They are sent to the various flying fields.

Mr. HIBBEN. Up to a month ago they were sent to Camp Dick, Tex.

Mr. WINTRINGER. Some of them were sent to Minneola and some were sent directly over, but since the fields in this country have been established they have been sending them to those fields. The majority of the men, however, have gone to Texas.

Senator SMITH. How many Princeton men have gone through the school?

Mr. WINTRINGER. At least 50 have gone through this section. The first section was 25. The first section of 25 was made up from the men who had been taking the flying field work. Since then we have had Princeton men come in. They have applied in the regular way. Some have been undergraduates and some have been graduates.

Senator SMITH. What is the total expenditure for the operation of the school for the 48 weeks?

Mr. WINTRINGER. \$136,248.

Senator SMITH. Dr. Hibben, I think we will go to the school and make a survey of that. Have you any suggestions to make?

Mr. HIBBEN. I think it should be mentioned that the president of the academic board is Prof. Gilbert Van Ingen.

Senator FRELINGHUYSEN. You have been practically the inspiration of this school?

Mr. HIBBEN. Well, I should not like to take the full credit for that. I think it came very largely from the fact that we had this flying school. It is due largely to the generosity of the alumni. I was instrumental in starting it and was very much interested in getting a ground school here, but we have had these men with us. The man who first gave us plans for the school was Mr. Percy R. Pyne, of New York. Then there was Prof. Augustus Trowbridge, now Maj. Trowbridge, on Gen. Pershing's staff, and Mr. James Barnes, a graduate of Princeton. He is now a major in the Aviation Service. Mr. James Barnes and Prof. Trowbridge started it, but back of it all was Mr. Pyne.

Senator FRELINGHUYSEN. Doctor, have you any suggestions to make in regard to this school and its further development?

Mr. HIBBEN. I think the one thing we are more concerned about than any other is the keeping up of the numbers.

Senator FRELINGHUYSEN. You mean to run to full capacity?

Mr. HIBBEN. To run to full capacity; yes, sir. We regard that as about 700. That is considered essential to the success of the school.

The second point is this: As far as possible as soon as a boy is graduated he should go immediately to some flying field and avoid the delay of a month or two months of inaction. These young fellows have been under tremendous pressure here; they have been at work night and day. If there is this inaction you have a reaction that sets it afterwards, and that has a demoralizing effect or tendency, at least.

Senator SMITH. We have not had flying fields. We have not had an organization prepared to take care of that. It was found easier to begin with the ground schools. They required less investment and less development. We have increased the number of flying fields, and they ought really to reduce it to a system and determine how many they can take care of and how rapidly, and organize the ground schools and the flying fields in cooperation, so that a man can go from one to another.

Senator FRELINGHUYSEN. I understand that the Wibur Wright field has 3,000 men, while the capacity is really 1,800. They are overcrowded.

Are there any suggestions you wish to make, Doctor?

Mr. WINTRINGER. The latest orders that we received were to the effect that we would receive 75 men per week up to July 13. After that date the number was to be decreased 40 per cent. If they do decrease that number, then it will drop to about 450 or 500.

Senator SMITH. Do you know how many they have at Boston?

Mr. WINTRINGER. That is now a school for radio work and engineering work. When the school was turned over at Boston the leading five schools were California, Texas, Illinois, Princeton, and Cornell.

Senator SMITH. The technological institutes had their course changed to advanced engineering?

Mr. WINTRINGER. The course at the university was changed.

Senator SMITH. What do you know about the New Brunswick plant?

Senator FRELINGHUYSEN. It is one of the important concerns making engines.

Senator SMITH. They make no planes there?

Senator FRELINGHUYSEN. No. The Standard Plane Co. at Elizabeth is where they make planes.

Mr. WINTRINGER. It is a matter of some concern that the employees utilized by the university, consisting of skilled mechanics, and the staff in the dining halls where the mess is maintained for the students in the School of Military Aeronautics, are subject to draft. Unless their services are considered as directly in the line of Government work it will be impossible to keep them in our employ. It appears to be, consequently, a very serious matter and would seriously hamper the work of the school.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

TUESDAY, JUNE 18, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON
MILITARY AFFAIRS.
New Brunswick, N. J.

The subcommittee met at the office of the Wright-Martin Aircraft Corporation, New Brunswick, N. J., Hon. Charles S. Thomas, presiding.

Present: Senators Thomas (chairman), Reed, New, Smith of Georgia, and Frelinghuysen.

STATEMENT OF MR. J. H. ANDERSON.

Senator NEW. Mr. Anderson, state what you are making.

Mr. ANDERSON. We are manufacturing the Hispano-Suiza motor.

Senator NEW. Of what horsepower?

Mr. ANDERSON. At this plant we have been manufacturing the 150-horsepower engine and we are just about to go into production on the 180 horsepower.

Senator SMITH. What number have you completed of the 150?

Mr. ANDERSON. I have sent for the representative of the sales department.

Senator NEW. For how many motors does your contract call?

Mr. ANDERSON. I will get it exactly in a minute. I think it is 3,000. It was 3,000 150-horsepower motors and 1,000 180-horsepower motors. I will confirm that when the sales manager comes. We are not making anything at the other plant, but we expect to go into production, I will say, in about 90 days. I may be a little bit wrong in that.

Senator SMITH. How soon will you be able to turn out the 300-horsepower motor?

Mr. ANDERSON. Our production schedule calls for the first motors to be delivered in October, I think.

The CHAIRMAN. Where is the other plant?

Mr. ANDERSON. At Long Island City. It is a Government-owned plant. The buildings and ground and some of the equipment are owned by the Government. We are leasing and supplying the additional equipment that we need.

The CHAIRMAN. Are you manufacturing anything now?

Mr. ANDERSON. Not at the Long Island City plant.

The CHAIRMAN. When do you expect to have it in commission?

Mr. ANDERSON. I was just saying in about 90 days.

The CHAIRMAN. Do you intend to devote that plant to the manufacture of the same material you are turning out here?

Mr. ANDERSON. The same type motor, but of a higher horsepower.

The CHAIRMAN. Have you a contract for them?

Mr. ANDERSON. Yes, sir.

Senator NEW. For how many of them?

Mr. ANDERSON. For three thousand 300-horsepower motors.

The CHAIRMAN. That is a contract of recent origin?

Mr. ANDERSON. Yes, sir. That was originally entered into back in November, 1917, at which time they were going to produce that motor at this plant. It was held up at that time, and now the contract has been modified to fit the conditions at Long Island City.

Senator SMITH. What plane would you use this 300-horsepower engine in?

Mr. ANDERSON. I could not say offhand.

Senator SMITH. Where are you shipping the 150-horsepower engines?

Mr. ANDERSON. They have been shipped to Buffalo.

Senator FRELINGHUYSEN. To the Curtiss plant?

Mr. ANDERSON. To Elizabeth, N. J., and the different Government fields down in Texas and Oklahoma.

Senator SMITH. Do you know what character of plane it is used in?

Mr. ANDERSON. I am not positive as to that.

Senator FRELINGHUYSEN. Are they preliminary training planes or advanced training planes?

Mr. ANDERSON. I have only taken this position recently, about two weeks ago, and there are a number of the details with which I am not familiar.

The CHAIRMAN. What is the capitalization of this company?

Mr. ANDERSON. I will want to confirm these figures if I give them to you now.

The CHAIRMAN. You may do that. A copy of this report will be sent to you for correction and revision.

Mr. ANDERSON. There is \$5,000,000 of preferred stock, 7 per cent. cumulative, and a million shares of common stock, no par, of which 900,000 are issued.

The CHAIRMAN. Are you a New Jersey corporation?

Mr. ANDERSON. A New York corporation.

The CHAIRMAN. When did you organize?

Mr. ANDERSON. In the fall of 1916.

The CHAIRMAN. Have you any plant other than this one at New Brunswick and the one at Long Island City?

Mr. ANDERSON. We have a plant at Los Angeles, Cal., which is operated by the Wright-Martin Aircraft Corporation of California. At the present time they are not doing anything out there. They have been making planes.

The CHAIRMAN. The Wright-Martin Co. is owner of what is known as the Wright airplane patents?

Mr. ANDERSON. Yes, sir.

The CHAIRMAN. Your company is one of the beneficiaries of what is known as the cross-license agreement?

Mr. ANDERSON. Yes, sir.

The CHAIRMAN. Did you absorb the Simplex Co.?

Mr. ANDERSON. We own all its stock and recently transferred its plant at New Brunswick, N. J., to the Wright-Martin Aircraft Corporation.

Senator THOMAS. Any other company?

Mr. ANDERSON. We own the stock of the General Aeronautic Co., which is practically a dormant concern to-day. I do not know why it was organized.

The CHAIRMAN. Was this incorporation and were these absorptions prior to our declaration of war on Germany, or were they afterward?

Mr. ANDERSON. The incorporation of the Wright-Martin Aircraft Corporation of New York and its ownership of subsidiaries were prior to our declaration of war with Germany. The transfer of the Simplex plant at New Brunswick from its subsidiary, the Simplex Co., was made as of January 1, 1918.

The CHAIRMAN. Will you also give a list of the shareholders?

Mr. ANDERSON. You want a list of the Wright-Martin Aircraft Corporation, of all the common shareholders and the preferred?

The CHAIRMAN. Yes.

Mr. ANDERSON. All right.

Senator FRELINGHUYSEN. Can you give us that information now?

Mr. ANDERSON. We have not got that here. That is with the agents in New York.

Senator FRELINGHUYSEN. They will furnish it to you?

Mr. ANDERSON. Yes; but we cannot get it immediately.

The CHAIRMAN. We do not expect you to get it immediately. Will you furnish it when the record is returned to you for correction?

Mr. ANDERSON. Yes.

(See Exhibit A.)

Mr. ANDERSON. Our organization is practically new throughout. Mr. Houston took hold about a year ago. Mr. Crane is vice president and chief engineer. He was the original Crane of the Crane-Simplex car. He is about the oldest man in length of service that we have here of the big men. He is not here to-day. It is very unfortunate that you came on a day that the men who really know what is going on are not here.

The CHAIRMAN. Has the Crane interest passed out? Has the Crane influence passed out?

Mr. ANDERSON. Mr. Crane's early associates are, I believe, no longer interested in the corporation. Mr. Crane is vice president in charge of engineering and one of the most important men in our organization.

Senator FRELINGHUYSEN. Who has control of the company?

Mr. ANDERSON. The Wright-Martin Co. stockholders.

Senator FRELINGHUYSEN. Who are the Wright-Martin people; who compose the corporation?

Mr. ANDERSON. We will get that information for you.

Mr. GILLET. I can give you a list of stockholders of six or nine months ago, but not of to-day.

Senator FRELINGHUYSEN. Who controls the company now?

Mr. GILLET. The only way we can get that is to—

Senator FRELINGHUYSEN. You surely know.

Mr. ANDERSON. I do not know.

Mr. GILLET. The interest nine months ago was a very diversified interest.

The CHAIRMAN. The present company was organized, was it not by Col. William E. Thompson?

Mr. ANDERSON. He was interested in some way. To what extent I do not know.

Mr. GILLET. He was not a large owner six or nine months ago?

The CHAIRMAN. My recollection was that the company was organized in the fall of 1916.

Mr. ANDERSON. Any information we could give you in that respect would not be information we could back up without the secretary's records.

Senator FRELINGHUYSEN. Was Mr. Baker ever employed by, or did he have anything to do with, the company?

Mr. ANDERSON. I have never heard of him. What Mr. Baker was that?

Senator FRELINGHUYSEN. I think his name was Charles D. Baker, of Cleveland, Ohio.

Mr. ANDERSON. I could not say as to that.

The CHAIRMAN. What has become of the other gentleman who was here a moment ago?

Mr. ANDERSON. He has gone out to get the production chart.

Senator SMITH. Who are the officers?

Mr. GILLET. Here is a chart right here [indicating chart on wall]. Mr. Houston is president and general manager.

Senator FRELINGHUYSEN. Who is vice president?

Mr. ANDERSON. We have several vice presidents. Mr. Henry M. Crane.

The CHAIRMAN. Is that of the elevator company?

Mr. ANDERSON. No, sir.

Senator FRELINGHUYSEN. Let us read the officials off from the chart.

Mr. ANDERSON. Mr. W. F. McGuire is vice president, to assist in developing production. Mr. H. M. Crane is vice president in charge of engineering. Mr. J. H. Anderson is vice president in charge of accounts and finance. Mr. R. F. Hoyt is secretary.

Senator FRELINGHUYSEN. Are these gentlemen in town?

Mr. ANDERSON. Mr. Houston, the president and general manager, is away. Mr. Crane is also away, as is Mr. Hoyt.

Senator FRELINGHUYSEN. When will they return?

Mr. ANDERSON. Mr. Houston and Mr. Hoyt will be back tomorrow.

STATEMENT OF MR. WILLIAM HAND.

The CHAIRMAN. What is your position here, Mr. Hand?

Mr. HAND. Assistant to the sales manager.

The CHAIRMAN. How long have you been with the Wright-Martin Co.?

Mr. HAND. Nine months.

The CHAIRMAN. Have you been located here during all that time?

Mr. HAND. I board here during the week and live in New York City.

The CHAIRMAN. Have you been assistant to the sales manager since the obtaining of the contracts for the manufacture of the Hispano-Suiza engines?

Mr. HAND. I came with the concern immediately after securing the first contract for Hispano-Suiza engines from the United States Government. That contract was No. 1487, order 8807.

The CHAIRMAN. Will you give the date?

Mr. HAND. For 500 150-horsepower Hispano-Suiza engines known as type A, dated July 30, 1917.

The CHAIRMAN. While you are about it, make a statement with regard to the other Government contracts.

Mr. HAND. Would you like me to make a list, giving the contracts which we have received from the Signal Corps of the Army? Do you want me to give them in tabulated form?

(See Exhibit B.)

The CHAIRMAN. You just gave an outline of the first one. Give the others.

Mr. HAND. The next order for Hispano-Suiza engines that came from the Signal Corps of the United States Army, War Department, was contract No. 2250, order No. 30066. This called for 1,000 type A 150-horsepower Hispano-Suiza engines. The contract was dated November 21, 1917, and the order November 13, 1917.

The CHAIRMAN. When you say the contract had a certain date and the order number a certain date, what do you mean by that?

Mr. HAND. The purchase order usually precedes the issuance of the contract by two weeks.

The next contract from the Signal Corps of the United States Army was No. 1867-A, purchase order No. 30011-A, both dated November 20, 1917. This covered 3,000 type H 300-horsepower Hispano-Suiza engines.

The next order for type A 150-horsepower Hispano-Suiza engines was dated January 19, 1918. The contract was No. 2250-1, dated February 2, 1918. This covered 1,000 type A 150-horsepower Hispano-Suiza engines.

The CHAIRMAN. Does that include all of them?

Mr. HAND. No sir., There is another one here.

Another contract was for 1,000 type A, 150-horsepower Hispano-Suiza engines, promulgated by the Signal Corps, United States Army, on March 2, 1918, order No. D. O. 30442, covered by contract No. 2250-2, dated February 25, 1918.

Although this contract covered 150-horsepower, we were requested by the Signal Corps to manufacture as many high compression 180-horsepower Hispano-Suiza motors as possible.

The CHAIRMAN. Do you mean that you were requested by the Signal Corps to manufacture as many 180-horsepower engines as you could under the contract calling for 150-horsepower engines?

Mr. HAND. Yes, sir.

The CHAIRMAN. Was there any arrangement made with regard to the difference in price?

Mr. HAND. No, sir. All these contracts, commencing with the first one I have given you, were on a cost-plus basis.

The CHAIRMAN. You have what is called the bogie price, have you not?

Mr. HAND. Yes, sir.

Senator NEW. What is that bogie price?

Mr. HAND. It varies in the different orders.

The CHAIRMAN. As between the 180-horsepower and the 150-horsepower engines, what is it?

Senator NEW. What is the 150-horsepower? Give those that vary.

Mr. ANDERSON. For the first 1,000, \$3,600.

The CHAIRMAN. What is it for these 180-horsepower machines which you have been requested to produce under your 150-horsepower contract?

Mr. ANDERSON. The bogie price for the second 1,000 motors was set at \$3,200, and for the third 1,000 motors at \$3,000, with an adjustment for changes in cost due to changes in labor rates. The bogie price for the fourth 1,000 motors is to be the actual cost experienced in January, 1918, with an adjustment for changes in cost due to changes in labor rates. There is no difference in the bogie cost of the 180-horsepower and the 150-horsepower motors, as the motors are practically identical in design. The higher power motor has a higher compression and is tested somewhat differently. It is therefore estimated that the cost of production will be about the same, although any difference will tend to increase the cost of the 180-horsepower motor.

(At this point informal discussion took place which the reporter was directed not to report.)

The CHAIRMAN. Go ahead with your next contract.

Mr. HAND. Our production schedule on Order No. 30442 calls for the delivery of high compression, 180-horsepower motors. On this order, known as type E, there is a call for 225 during the month of July, 1918; 350 during the month of August, 1918; and 225 during the month of September, 1918. This schedule is in no way binding as far as type E motors are concerned under this contract.

The CHAIRMAN. Does that conclude the list?

Mr. HAND. No; there is one more.

The last order which we have received, order No. 31072, dated ———, covered by contract No. 2250-3, dated May 23, 1918, calls for 1,000 type E (180-horsepower high compression motors), or type L, 150-horsepower, with certain changes from type A.

The CHAIRMAN. Now, Mr. Hand, will you tell us when the first work was begun under any of these contracts for production?

Mr. HAND. The first contract received from the Signal Corps of the United States Army called for 500 Type A 150-horsepower motors. This contract was dated July 30, 1917, and the purchase order was dated July 14, 1917. The provision under this order, referring to deliveries, stipulated that they must commence within 90 days from the date of the contract and determination of the final details.

In a letter dated December 15, 1917, addressed to the office of the Chief Signal Officer, War Department, Washington, D. C., attention of Lieut. Emmons, signed by G. H. Houston, general manager, the attention of the Signal Corps was called to the fact that not until October 25, 1917, was there a completion of the final details.

The CHAIRMAN. Did you begin any construction prior to the date of the letter that you have just referred to; in other words, was it possible for you to go ahead with any construction until the final details were arranged?

Mr. ANDERSON. I think that question would have to be answered by Mr. Houston. All Mr. Hand can do is to give you what the sales records show.

The CHAIRMAN. I take it that if the details, by which I suppose you mean the general plans of the work to be done, etc., were not completed until long after the contracts were made, you would have records to that effect?

Mr. ANDERSON. What I mean by that is that the production program on that was laid out by Mr. Houston.

The CHAIRMAN. He could not lay out a program very well if the details were incomplete, or if changes were being made in the plans.

Mr. HAND. The final approval by the Signal Corps of the design——

Senator NEW (interposing). That is what we want to get at.

Mr. HAND. The changes were by the Signal Corps and not by the Wright-Martin Co.

Senator REED. Is it not possible that while the plans were not absolutely complete as to details, yet much could have been done with such plans as you had? What about that?

Mr. ANDERSON. The sales department does not know about that.

Senator SMITH. If he does not know he can say so; if he does know, he can tell.

Mr. HAND. He means whether motors had been constructed prior to the final details.

Senator REED. I will make it perfectly plain so that there can not be any mistake about it. It is entirely possible that your plans would not have been handed to you in absolute completion and yet you might have had plans so far completed that you could get raw materials, and so that you could lay out parts of the engines, the plans of which you did have in a completed state, and go ahead with your work. Yet, you could truthfully say that you never did have the completed plans, and, therefore, never could produce the completed engine even until a much later date than you actually began work. What are the facts about that?

Mr. ANDERSON. I do not know whether Mr. Hand knows.

Senator SMITH. If he does not know, he can say so.

Mr. HAND. I can say that on November 5, 1917, we had finally assembled 64 Type A Hispano-Suiza motors and delivered one.

The CHAIRMAN. 150-horsepower motors?

Mr. HAND. Yes, sir.

Senator SMITH. You had delivered one?

Mr. HAND. Yes, sir.

Senator REED. Is there not somebody connected with this factory who knows whether or not you laid idle all these months, or whether you actually had been at work getting materials to go ahead?

Mr. ANDERSON. We were not idle during this period but were working constantly on the completion of our order for motors for France and in getting ready for production for this country. Our chief delay lay in our contracts prior to October 2, 1917, being so small as not to justify any extensive preparation, and after October 2, in the frequent change in plans of the Government.

Senator REED. Who would know how much you were delayed?

Mr. ANDERSON. Mr. Crane would know about that, as would Mr. Houston.

The CHAIRMAN. You said something about a letter just now.

Mr. GILLET. Mr. Houston was general manager at the time of the development, and consequently is familiar with all the details, and he naturally knows more about those things.

Senator FRELINGHUYSEN. I suggest that we ask Mr. Houston to come to Somerville, N. J., to-morrow evening, and bring with him such records and files as he may need in order to give the committee the information it desires.

The CHAIRMAN. I presume if he were to come he would want the records of the office so that he could refer to them.

Senator NEW. That is where Senator Frelinghuysen's suggestion that he come to Somerville for examination might not work out. He may not have the full record.

Mr. ANDERSON. I think he has all the data which you require at his finger tips.

Senator NEW. We might, at all events, have it understood here that Mr. Houston is to fill into this record the information that this committee seeks, in case he is not able to come to Somerville. It would be better for him to come to Somerville, if that is possible.

Senator FRELINGHUYSEN. Yes, with the data that is necessary.

Senator NEW. And failing to do that, he can fill it in when this statement comes back to him for correction.

The CHAIRMAN. Mr. Hand, you can give the record of production?

Mr. HAND. Yes, sir.

Senator REED. Let us have a copy of that letter of December, 1917, that you referred to.

Mr. HAND. Yes, sir.

Senator FRELINGHUYSEN. Mr. Houston was previously superintendent and manager of the Curtiss plant at Buffalo?

Mr. HAND. General manager.

Senator FRELINGHUYSEN. General manager of the Curtiss plant at Buffalo?

Mr. HAND. Yes, sir.

Senator REED. Previous to what?

Senator FRELINGHUYSEN. Previous to his connection with this company.

Senator REED. Why did he leave there?

Mr. HAND. Mr. Houston is a consulting engineer and a member of the engineering firm of George W. Goethals & Co., formerly known as Goethals, Jamieson, Houston & Jay, and was retained by the Curtiss Corporation to reorganize their operating department and build up their production. He was connected with the Curtiss Co. about nine months prior to March, 1917, and left them when the Willys interests came in.

Senator SMITH. What is his age?

Mr. HAND. He is about 35 years of age.

Senator FRELINGHUYSEN. Prior to that time what was his employment?

Mr. ANDERSON. Prior to his taking up consulting work he held a responsible position as general manager of the Root & Vandervoort Co.

Senator SMITH. What is the business of that company?

Mr. ANDERSON. Manufacturers of gas engines.

Senator SMITH. He has specialized in gas engines?

Mr. ANDERSON. Yes, sir. He has made a complete study of aeronautical work, also.

Senator FRELINGHUYSEN. Mr. Chairman, I suggest that Mr. Houston be invited to make arrangements to come to Somerville to-morrow night. We will return by 6 o'clock, and if he will come by 8 we can examine him for a short time.

The CHAIRMAN. Yes.

Let us turn to the production of the Wright-Martin Co. Can you give us the production of engines under these contracts? If you can, just proceed.

Mr. HAND. The rate of shipment?

The CHAIRMAN. The total number per month since you began, giving the first month, the second month, and so on.

Mr. HAND. I will have to figure that from these reports.

The CHAIRMAN. You have not got it in shape so that you can state it off-hand?

Mr. HAND. No, sir.

The CHAIRMAN. Then you can put it in the record when it comes to you later?

Mr. HAND. Yes, sir.

(See Exhibit C.)

Senator NEW. Are you up to contracts in point of time?

Mr. HAND. We will be at the end of this month. I believe we will end July ahead of the contracts.

The CHAIRMAN. What is the rate of production per month?

Mr. HAND. Five hundred per month, on a contract schedule of \$350 per month.

The CHAIRMAN. Will you be able to continue that rate of production from now on?

Mr. HAND. We expect to.

The CHAIRMAN. What are the contract requirements of monthly production? Are you up to or behind the contract requirements?

Mr. HAND. I believe, without looking at the records which I have not with me, that we are slightly behind the contract deliveries.

The CHAIRMAN. Slightly behind?

Mr. HAND. Yes, sir.

The CHAIRMAN. How many hands do you employ here?

Mr. HAND. Approximately 4,500.

The CHAIRMAN. What proportion of your force here is female?

Mr. ANDERSON. A very small percentage. We employ no female help in the factory. We employ stenographers and clerical female help, but no factory hands.

The CHAIRMAN. In other words, in your factory departments you have no female help?

Mr. ANDERSON. No, sir; not as machine operators.

Senator REED. Have you been able to get all the hands you need?

Mr. ANDERSON. Yes, sir. We have not had any serious labor difficulties here.

Senator REED. Have you had sabotage or interference of any sort with production, or any German influence?

Mr. ANDERSON. Once in a while; but we have a plant protection department here, which is thoroughly organized.

The CHAIRMAN. How long have you had it?

Mr. ANDERSON. Practically since the company started. Recently, since about two months ago, it was reorganized, and we have that protection in every office and every department of the company.

The CHAIRMAN. I wish you would give us in detail the circumstances in connection with every instance where you have discovered some interference.

Mr. ANDERSON. Could that be filed in a letter? That will have to be taken from the records.

The CHAIRMAN. We would like to have it if you can state it now.

Mr. ANDERSON. Our man in charge of plant protection here is a new man. However, Mr. Houston has that somewhere in his records.

The CHAIRMAN. Can Mr. Houston bring those records over tomorrow?

Mr. ANDERSON. I will see that he does.

The CHAIRMAN. Have you had anything of that sort recently?

Mr. ANDERSON. No; I do not think we have, and what trouble we have had has been small.

The CHAIRMAN. Has there been any of sufficient importance to retard production?

Mr. ANDERSON. No, sir; I should say that production has not been retarded materially by it.

The CHAIRMAN. Mr. Hand, your last contract calls for 1,000 180-horsepower engines?

Mr. HAND. It called for either 150-horsepower type I motors or 180-horsepower type E motors. It is optional.

The CHAIRMAN. That contract was dated when?

Mr. HAND. It was dated May 25, 1918.

The CHAIRMAN. Now, if you are capable of producing 500 machines per month it would require but two months to complete that contract?

Mr. HAND. Exactly.

The CHAIRMAN. When Mr. Houston was in Washington, he told me unless he could get, and get at once, some new contract of considerable quantity, there was little ahead in prospect for his concern to do after October.

Mr. HAND. Quite true.

The CHAIRMAN. Do you know whether or not any negotiations are pending for other contracts?

Mr. HAND. He can best answer that question.

The CHAIRMAN. You do not know as to that?

Mr. HAND. No, sir.

The CHAIRMAN. Are you able to say from your experience here how long in advance of deliveries contracts should be obtained so that you can do your best toward rapid production in the way of assembling material, etc., in anticipation of the delivery? In other words, how many months of time in advance of the time when you are expected to make deliveries should you have contracts in order to do competent work and get quality production?

Mr. HAND. I would say at least six months, but Mr. Houston is the best man to answer the question for you, in view of his position and experience.

Mr. ANDERSON. That is, I might say, a question that I would rather not have go into the record from Mr. Hand's standpoint.

The CHAIRMAN. I asked whether he was competent to answer the question. Our main purpose on this trip is to find out whether or not these motors can be rapidly produced, what has been the matter, what has kept down production of motors and machines, and particularly what the situation is with reference to contracts for future deliveries, and whether they exist in sufficient quantity to justify the expectation of a large and continuous quantity delivery equal to the demands which this war will undoubtedly make upon us.

Mr. ANDERSON. That is an added reason why I would like to have you meet Mr. Houston, because when in New York I was at a meeting with Signal Corps officers, and Mr. Houston went over with them a tentative layout for this Long Island plant, showing the Army officers what the people in Washington were asking to have done in order to bring production up. He has a tentative schedule laid out as to what money is required, what floor space is needed, etc. He has the facts.

The CHAIRMAN. The long and short of the thing is that the bulk of the information which we want we must depend upon Mr. Houston for.

Mr. ANDERSON. Absolutely. There is no other man who can get that information for you as well as he can.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JUNE 19, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS.
Somerville, N. J.

The subcommittee met at the home of Senator Frelinghuysen, Somerville, N. J., Hon. Charles S. Thomas, presiding.

Present: Senators Thomas (chairman), New, and Frelinghuysen.

STATEMENT OF MR. GEORGE H. HOUSTON.

The CHAIRMAN. Mr. Houston, when did you first secure your present contract for the manufacture of Hispano-Suiza engines from the Government?

Mr. HOUSTON. We took a small contract dated July 30, 1917, for 500 motors from the United States Government. We took a contract for 1,000 motors on November 13, which has been supplemented from time to time by lots of a thousand at a time, until we have taken under this same contract 4,000 in all. The first thousand has now been delivered, and the greater part of the second thousand, and we will begin delivery on the third thousand very shortly.

On November 20 we took another cost-plus contract for 3,000 300-horsepower Hispano-Suiza motors for delivery following the first thousand of the small motors under the contract mentioned above. Later this contract was held up, with the understanding that our New Brunswick factory would be kept busy at a reasonable rate by additional supplements to the small motor contract, until the 300-horsepower motors should be wanted. Finally, it was determined that the New Brunswick factory could never be used for making 300-horsepower motors, as it would be continually wanted for the production of the small motors.

The CHAIRMAN. When was that determination reached?

Mr. HOUSTON. On May 11 a supplement was made to the 300-horsepower motor contract releasing our hold-up on the first 1,000 motors, and giving us the use of the General Vehicle Co. plant at Long Island City for the production of these large motors. We are now in process of preparing this plant at Long Island City for the production of these motors, the delivery schedule of which starts in October, 1918. I believe that answers your question. I might add that after the first order for 500 motors on a flat-price basis was given, we were given a second order for an additional 500 on a flat-price basis, and on November 2, 1917, this order was canceled and replaced by a cost-plus order for 4,000 200-horsepower Hispano-Suiza motors,

which, in turn, was canceled on November 13 by the cost-plus contract first mentioned.

The CHAIRMAN. The contracts which the director of aircraft production has furnished this committee show that you had one contract dated the 14th day of July, 1917, for 500 150-horsepower Hispano-Suiza motors, which you have completed; a contract of the 21st of November, 1917, for 1,000 machines, which has been completed; a contract, dated January 19, 1918, for 1,000 Hispano-Suiza motors, 787 of which were completed on the 31st of May.

Mr. HOUSTON. That is the supplement to the first contract. That is one of the supplements I have mentioned.

The CHAIRMAN. Then there is a contract dated the 2d day of March, 1918, for an additional 1,000.

Mr. HOUSTON. That is the second supplement, which we are ready to begin delivery on now. That is another 1,000 of the same specifications.

The CHAIRMAN. Making a total of 3,500 machines?

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. Of which you had delivered at that time 1,578.

Mr. HOUSTON. That is right. We have had since that time another order for another 1,000.

Senator THOMAS. Making 4,500 in all.

Mr. HOUSTON. That is right.

The CHAIRMAN. When did you get your last order?

Mr. HOUSTON. In the latter part of May. The dates that I have given you vary a little from these, but they are essentially correct.

The CHAIRMAN. How long, at your present rate of production, will it require to complete these contracts exclusive of the 300-horsepower contract?

Mr. HOUSTON. We are delivering at the rate of 500 per month at the present time. We have about 2,400 motors to deliver. It will take between four and five months to complete delivery. It requires, however, at least four months, and five months should be given, from the time the contract is signed until delivery starts, if an economical procurement, fabrication, and assembly of material is to be obtained.

The CHAIRMAN. You have, then, contracts which at present rates of delivery will keep your New Brunswick plant employed for something less than five months?

Mr. HOUSTON. No. A part of our New Brunswick plant will begin to shut down within six weeks.

The CHAIRMAN. You have 2,400 machines yet?

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. And make 500 a month.

Mr. HOUSTON. But that is completion, Senator. Part of our plant will run out of work long before the final operations are complete. Our foundry, for instance, must work on the material at least 90 days before it is shipped.

The CHAIRMAN. Do you supply your own castings?

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. You have, under your present contracts, sufficient work to keep your New Brunswick plant employed for how long?

Mr. HOUSTON. Our initial departments, from a month to six weeks: our finishing department, from four to five months.

The CHAIRMAN. What is your working force?

Mr. HOUSTON. We are employing at the present time on the small motor at the New Brunswick plant somewhere between 4,000 and 4,200 men—about 4,800 in all, the remainder being employed in the development of the 300-horsepower motor and the preparation of the 300-horsepower factory.

The CHAIRMAN. What prospect have you for additional orders from the Government?

Mr. HOUSTON. We are negotiating with the Government now for the delivery of motors for the remainder of 1918, and all of 1919. We have been asked to state the conditions under which we could deliver motors of the 150–180 horsepower specifications, at New Brunswick, at the rate of 750 motors per month plus spare parts, during all of 1918 and 1919. We have also been asked to state the conditions under which we could produce the 300-horsepower motors through 1919, and the maximum production we can possibly obtain on this motor. We have made a proposal to the Government on this joint production, which is now under consideration by them.

The CHAIRMAN. When was that proposal made?

Mr. HOUSTON. Last week. That is what we are going down on tomorrow.

The CHAIRMAN. Have you any assurance of an early determination of the matter?

Mr. HOUSTON. No positive assurance of an early determination.

The CHAIRMAN. With whom are you negotiating?

Mr. HOUSTON. Mr. Fletcher, of the Bureau of Aircraft Production.

Senator FRELINGHUYSEN. Is Mr. Fletcher the man who was president of the American Locomotive Co.?

Mr. HOUSTON. No; Mr. Fletcher was president of the La Luz & Los Angeles Mining Co., I believe.

The CHAIRMAN. Is he a Los Angeles man?

Senator FRELINGHUYSEN. I do not know his history.

The CHAIRMAN. Is he the man who negotiated your present contract?

Mr. HOUSTON. He negotiated the last supplement to the small motor contract and negotiated the last supplement to the large contract, but he did not negotiate either of the main contracts.

The CHAIRMAN. Are these contracts on what is called the cost-plus basis?

Mr. HOUSTON. Do you mean the cost-plus percentage basis or the flat-profit basis?

The CHAIRMAN. Isn't that the same thing?

Mr. HOUSTON. There are two different kinds of cost-plus contracts. One is the cost plus a percentage of the cost as profit; the other is cost plus a given number of dollars per unit as profit.

The CHAIRMAN. And yours is of the latter class?

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. What is the so-called bogie price for these 150–180 horsepower machines?

Mr. HOUSTON. The bogie price on the original contract was based at \$3,600, which was determined by an independent board of arbitration. That applied to the first 1,000 motors only. The second 1,000 motors' bogie price was reduced by agreement to \$3,200, because

we had had more experience. The bogie price on the third thousand was reduced to \$3,000 plus the increased cost due to increases in the wages of our workmen to practically the Shipping Board rates, the rates having been raised in order to avert a strike. The bogie price of the fourth thousand was to be our January cost plus this increased cost of labor, which we estimate will make it about \$3,300.

The CHAIRMAN. Is your compensation determined by the bogie price?

Mr. HOUSTON. The profit on the first thousand was figured at 15 per cent of the bogie price; that is, \$540. The profit on the second thousand was \$480; the profit on the third thousand was to be \$450 plus 15 per cent of whatever the labor increase should be, and the profit on the fourth thousand would be 12½ per cent of the cost as determined above. The bogie price on the first 1,000 of the 300-horse-power motors was fixed at \$5,000.

The CHAIRMAN. Each?

Mr. HOUSTON. Yes, sir. That is a much larger motor. It is about twice as large. This makes a profit of \$750 per motor. The bogie price on the second thousand is to be the cost experienced in making the first thousand, after deducting those unusual expenditures which would not be repeated. The bogie price on the third thousand is to be the cost of the second thousand adjusted accordingly. The profit on the second and third thousand is to be equal to the current rate of profit being paid by the Signal Corps on contracts of this nature at the time we are directed to go ahead with the second and third thousand. We have not been told to go ahead yet.

The CHAIRMAN. Did you have any difficulty or experience any delay in securing plans for this engine after your contract was made, between the time you got the contract and the time you wanted to begin work?

Mr. HOUSTON. We secured the American rights for the manufacture of this motor in January of 1916.

The CHAIRMAN. From the French owners?

Mr. HOUSTON. From the Hispano-Suiza people of Barcelona, Spain, and Paris, France. With the consent of the French Government we contracted for 450 of the first 800 motors that the Hispano-Suiza Co., of France, made for the French Government. These were supposed to have been delivered during 1916, but for various reasons they were not delivered until the fall of 1917. We have never obtained any engineering or design specification data from the Signal Corps on this matter, but have performed all of our own engineering functions and submitted our design to the Government for approval. We made proposals to the Signal Corps for furnishing motors in large quantities during the latter part of May and during the spring of 1917. Large quantity production was discussed at this time, but for various reasons the orders given were only for 500 motors on a flat price basis as I have already mentioned, until the 4,000 motor order was given to us in October.

The CHAIRMAN. Were you prepared at the time the United States entered the war to enter at once upon the manufacture of these engines?

Mr. HOUSTON. We were not prepared to enter at once upon the manufacture of these engines for the United States Government.

We had a plant investment of nearly 2,000,000, largely engaged upon the manufacture of these engines at that time, and there were only 450 motors to be produced before we could have begun deliveries for the United States Government. The delivery of these 450 motors to the French Government could have been largely expedited if we had had additional orders to work upon, but we had to carry our development work along quite slowly during the summer and fall of 1917 to prevent running out of work.

The CHAIRMAN. If you had received orders from the Signal Corps in May or June for quantity production, how soon could you have begun deliveries under that contract?

Mr. HOUSTON. On July 25 I stated to the Signal Corps that in the event of orders being placed at once for a sufficient quantity to make the development worth while we would undertake, that is the Wright-Martin Co., would undertake to deliver during the year ending July 30, 1918, 7,540 motors, beginning at the rate of 60 in August and building it up to 1,250 per month the following May. We stated, however, that it would be impossible to develop such a quantity production on anything less than a year's orders.

The CHAIRMAN. In making the last answer you referred to a statement to the Signal Corps.

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. Is that in a document?

Mr. HOUSTON. Yes, sir.

The CHAIRMAN. I will ask you what that is?

Mr. HOUSTON. It is a letter, dated July 25, to Mr. S. D. Waldon, of the Aircraft Production Board. It reads as follows:

JULY 25, 1917.

Mr. S. D. WALDON,

Aircraft Production Board, Washington, D. C.

DEAR SIR: Pursuant to our conversation to-day, we submit the following schedule of deliveries as that which is possible for us to obtain on the Hispano motor of either direct driven or geared specifications on deliveries after the present orders, providing orders are placed with us or some definite arrangement made for same at once, so that we have sufficient assurance to warrant us in making the necessary capital expenditures and providing further that arrangements can be made for the Government to furnish us the necessary working capital in excess of our present resources:

Motors.		Motors.	
August	60	March	800
September	100	April	1,000
October	160	May	1,250
November	240	June	1,250
December	340	July	1,250
January	460		
February	600	Total	7,510

This will clean up our French contract and our present United States contract for 500 early in February. If the drawings of the present French geared motor and the sample motor are furnished to us by August 1 we would undertake to make deliveries of 50 of these motors in January as a part of our January schedule and increase our output of these motors so that they would take our full capacity upon the completion of our present orders. To obtain this production will require very unusual efforts on our part, so we trust to obtain a decision from the production board as quickly as possible.

Very truly, yours,

WRIGHT-MARTIN AIRCRAFT CORPORATION.
GEORGE H. HOUSTON, *General Manager.*

The CHAIRMAN. Did you receive any response to that letter?

Mr. Houston. On July 27 we received the following letter:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, July 27, 1917.

Mr. GEORGE H. HOUSTON,
General Manager Wright-Martin Aircraft Corporation,
60 Broadway, New York City.

DEAR SIR: We are promptly in receipt of your letter of July 25, with schedule of engine output up to August 1—a year from now.

It is a little disappointing to us to note that you will not obtain more than 50 of the new geared down Hispano during next January. Is not there some way of speeding this up?

Mr. Montgomery is working on the proposition of advanced payments.

Is there not some way you can increase the number of Hispanos during January?

Very truly, yours,

S. D. WALDON,
Aircraft Production Board.

The CHAIRMAN. Have you replied to that?

Mr. Houston. I doubt if I made any written reply to that letter.

The CHAIRMAN. As a matter of fact, you got no contract until October?

Mr. Houston. Except for the 500 mentioned.

The CHAIRMAN. You had that before?

Mr. Houston. Yes, sir; we had that before this.

The CHAIRMAN. When you got the contract, it was for only 1,000?

Mr. Houston. The contract was originally for 4,000.

The CHAIRMAN. The contract of October?

Mr. Houston. That was for 4,000 200-horsepower motors. That was canceled a month later. On November 13 we were given a contract for a thousand of the present specifications, and we got a later contract for 3,000 of the 300-horsepower.

The CHAIRMAN. Why was that contract for 4,000 made in October reduced to 1,000 in the November following?

Mr. Houston. One thousand of the small specifications and 3,000 of the large specifications was considered equivalent to the 4,000 ordered in October.

The CHAIRMAN. That, however, postponed the contract for a month and then changed it very materially, did it not?

Mr. Houston. Yes, sir.

The CHAIRMAN. To what extent did that affect delivery?

Mr. Houston. I am going back to answer that in a broad way.

In August of 1917 we brought Prince Andre Poniatowski, our Paris representative, to America, with all the latest information with regard to the development of the Hispano-Suiza motor in France. We took him to Washington for a conference with the Aircraft Production Board. We laid before them the plans for two different types of geared motors and a new type of 8-cylinder, 300-horsepower motor.

We stated to the board that the French engineers of the Hispano-Suiza Co. were of the opinion that the geared motor was obsolete and that the 300-horsepower motor, direct drive, would take its place: that the application of this new motor would be delayed in France, due to the very large orders for the geared motors then in process of performance. We strongly recommended that the Aircraft Production Board avoid giving contracts for the geared motors, but go directly to the 300-horsepower direct drive. This was, as I have

already stated, in August. Well, negotiations dragged through September until the latter part, when we were told that instructions from Gen. Pershing made the placing of an order for 4,000 of the geared motors imperative. Early in November this contract was canceled and replaced by one for 1,000 of the small motors, and later in the month by 3,000 of the new 300-horsepower motors, which we had presented for consideration in August. The 300-horsepower contract was again held up until released by a letter from Mr. Potter in April.

The CHAIRMAN. So that, as a matter of fact, you were not able to go ahead with quantity production under these contracts of October and November until last April.

Mr. HOUSTON. Yes, sir; that is, for the large motor. For the small motors we never had a quantity of sufficient volume to make real quantity production possible until three months ago.

The CHAIRMAN. The reduction of the small-powered motor from 4,000 to 1,000 so reduced the number as to make it impossible for you to deliver in quantity production until that number was increased by subsequent contracts some time afterwards.

Mr. HOUSTON. That statement expresses the condition. I will state further that from the time we signed our first contract until the present moment we have been ahead of our contract deliveries, except as we lost about three weeks in January due to a shutdown to take an inventory and swing to a cost-plus basis, and due to a continuous interruption in January and February on account of coal shortage. In May we delivered 530 motors on a contract schedule of 350.

The CHAIRMAN. What is the present delivery?

Mr. HOUSTON. You mean the schedule?

The CHAIRMAN. What number of machines per month are you now completing and delivering to the Government?

Mr. HOUSTON. We are now running on an average of 500 motors per month. Our schedule for June is 400; July, 450; August, 500; and from then on, 500 per month.

The CHAIRMAN. Is the 300-horsepower engine covered by your April contract—your November and April contracts—the same type engine of which you have in the factory at New Brunswick?

Mr. HOUSTON. The 300-horsepower engine is similar in all essential respects to the 150-horsepower engine, the essential differences being those of dimension only.

The CHAIRMAN. Has the company which you represent any facilities for plane production?

Mr. HOUSTON. The Wright-Martin Aircraft Corporation at the present time has no facilities for plane production. In April, 1917, it owned, and still owns, the Glenn L. Martin Co., of California, the name of which was later changed to the Wright-Martin Aircraft Corporation of California. In the summer of 1917 the Aircraft Production Board stated to us that they wished us, as a corporation, to enter into the production of airplanes as a whole. We stated that we would be glad to develop the Los Angeles factory to as large capacity as could be kept busy on the western coast, if the Government would give us contracts. They gave us an initial order for 50 planes, which we completed on time.

The CHAIRMAN. What type of plane?

Mr. HOUSTON. The initial order for the 50 planes was for the J-1 training plane, used with the Hall-Scott motor, and we completed

them on time but at a greatly increased cost, due to the miserable condition of the drawings and specifications furnished us. I am told by the factory manager on the west coast that we put through over 4,000 changes in producing these 50 planes, at a cost to us of about \$60,000 over and above what we estimated. Before we completed these planes we entered into negotiations with the Government for additional business, but as we were never able to come to an agreement as to the terms and quantities, we ultimately said we would prefer closing out. We have since shut down this plant and sold off most of the equipment, as under the conditions under which we were required to work we could not afford to carry it on.

At the time the Aircraft Production Board took the position that they wanted us to enter into the production of airplanes, we stated that aside from the western plant we did not have capital facilities for the manufacture of planes. We stated, however, that we would endeavor to develop a company, to be controlled by us, for this purpose, and, after a delay of a few weeks, we made a formal proposal that in the event of a contract being procurable under conditions that would make it possible, we would organize a corporation capitalized for \$5,000,000 to take over a body plant in this country and have at least \$3,000,000 in cash resources, to be organized and managed by Goethals, Jamieson, Houston & Jay (Inc.), in conjunction with their management of the Wright-Martin Aircraft Corporation. The Aircraft Production Board was not interested in this proposal, however, and nothing ever came of it.

The CHAIRMAN. When was that proposal made?

Mr. HOUSTON. I will say in August, but that is subject to revision. I can attach a copy of the letter later on.

(The letter referred to is here printed in full, as follows:)

GOETHALS, JAMIESON, HOUSTON & JAY (INC.),
New York, August 7, 1917.

AIRCRAFT PRODUCTION BOARD,
Council of National Defense,
Washington, D. C.

GENTLEMEN: We, the undersigned, have been asked by Mr. Houston, general manager of the Wright-Martin Aircraft Corporation, to undertake the manufacture of airplanes for the United States Government, and to give special attention to the furnishing of airplanes for use with Hispano-Suiza motors. After careful consideration of the conditions surrounding such work in the United States at the present time we wish to take this occasion to state what we are in position to do.

If the Government desires us to undertake the manufacture of airplanes, and will give us an order amounting to at least \$30,000,000 gross sales price for delivery between now and July 1, 1918, on the following general terms and conditions, we will undertake to organize a corporation with \$6,000,000 capital, made up of \$3,000,000 in notes with from two to five years maturity, \$2,000,000 of which will be sold at once and the third million held in escrow for future needs, and 60,000 shares no par value stock which will be sold so as to net the corporation \$3,000,000. Notes and stocks will be sold without profit by the underwriters, they securing their profits by participating in the net earnings of the corporation.

This corporation will acquire the plant of the Springfield Body Co. at a reasonable price. The estimated value of this plant is \$2,000,000. It will also provide an adequate organization and an effective management through the services of Goethals, Jamieson, Houston & Jay (Inc.), and will undertake to manufacture and deliver in a satisfactory manner the planes contracted for.

CONDITIONS UNDER WHICH THIS BUSINESS WILL BE UNDERTAKEN.

First. The sales price is to consist of the manufacturing cost experienced, plus a fixed profit per plane to be agreed upon. An estimated cost for each

article made is to be established, and if the cost experienced is found to be less than this estimated manufacturing cost the company is to participate in the savings.

Second. The manufacturing cost is to be defined so as to include all direct material, direct labor, full manufacturing overhead, any royalties on patents which may have to be paid, a reasonable depreciation for all fixed assets as they now stand in the plant of the Springfield Body Co., and a full and complete amortization of all increase in fixed assets made for the purpose of executing this contract.

Third. The company will have about \$3,000,000 in cash. The remainder of the working capital required to execute this or additional contracts is to be provided by the Government on some satisfactory basis.

Fourth. The Government is to assist in so far as it can to obtain the materials necessary for making planes.

Fifth. No penalties are to be provided for failure to deliver the product on time, although the company is to use its best efforts in every way to execute the contract in accordance with the established deliveries.

The plant of the Springfield Body Co. is now available for this work. The proposed corporation can be formed and manufacturing started without delay.

Trusting that we may be of service to you in this connection, we remain,

Yours, very truly,

C. J. JENISON,

BERTRON, GRISCOM & Co.

J. F. ALVOED.

B. F. EVERITT.

GOETHALS, JAMIESON, HOUSTON & JAY (INC.),

By GEO. W. GOETHALS.

The CHAIRMAN. What was the capacity of the California plant for plane production?

Mr. HOUSTON. In April, 1917, our California plant had a capacity of about two planes per week of the average reconnaissance type. We proposed to develop this to one plane or two planes per day if the Government desired and would insure us sufficient business to keep us busy for a reasonable period of time.

The CHAIRMAN. You would have been able to do it?

Mr. HOUSTON. We actually developed this plant to a capacity of one J-1 plane per day in the performance of the 50-plane contract.

The CHAIRMAN. Do you know why the November contract for three thousand 300-horsepower engines was suspended until April before you were permitted to go ahead with it?

Mr. HOUSTON. I have never been told definitely why, but I have been told in a general way that no plane had been developed in Europe that would successfully fly the motor. It was feared that the motor was too delicate for the heavy work necessary for a motor of such horsepower.

The CHAIRMAN. Is that motor being used in Europe?

Mr. HOUSTON. This motor has not yet been put into common use in France. Its development at the present time is from three to four months ahead of our own development. For the past eight months it has been used in sufficient quantity in actual flying to thoroughly demonstrate its effectiveness.

The CHAIRMAN. In what type of machine?

Mr. HOUSTON. According to a statement made to me by our French representative, there are a number of planes that have been used for experimental work, and particular attention has been given to applying the 300-horsepower motor to the Spad plane, originally made for the 220-horsepower Hispano-Suiza motor. An unfortunate accident

to a plane early in the experimentation with the Spad caused a decided setback in its development.

The CHAIRMAN. Have there been any instances of sabotage or interference with or attempted delays in production of these engines in your plant?

Mr. HOUSTON. There had been an undercurrent of sabotage and interference prior to the time we started production. At one time it became so serious that I gave it a great deal of personal attention and organized what I considered to be an effective secret service. I was dissatisfied with the man in charge of this secret service, and I ultimately obtained Mr. Wheatley, who has for many years been with the secret service of the Treasury Department, to organize in my own organization an effective plant-protection secret service. We have never been able to entirely eradicate sabotage, particularly with respect to what we believe has been an effort to corrupt and spoil our workmen. We consider we have it under control at the present time and trust to keep it so.

Senator FRELINGHUYSEN. Have you many men of German nationality?

Mr. HOUSTON. We had last year a considerable number of Germans. We have since eliminated every man of German descent who is not an American citizen.

The CHAIRMAN. You are keeping up your organization, your secret organization, as effectively as possible?

Mr. HOUSTON. We are keeping it up quite effectively, and have some of the best men in America at work protecting our plants.

The CHAIRMAN. Do you consider that thus far there has been any defective construction which, used in these engines, might result disastrously?

Mr. HOUSTON. I do not think so. We have had a particularly loyal inspection force, headed by a very competent group of engineers. I have felt all the time that the only real effect of the sabotage and interference has been to increase the cost rather than decrease the quality or decrease the output.

The CHAIRMAN. I think that is all I care to ask.

Senator FRELINGHUYSEN. I was going to ask you who controls your corporation?

Mr. HOUSTON. I do not know.

Senator FRELINGHUYSEN. Who is the largest stockholder?

Mr. HOUSTON. Hayden, Stone & Co. are the largest holders of preferred stock. The management of the Wright-Martin Aircraft Corporation has been vested by the directorate in the corporation of George W. Goethals & Co., and I, as a representative of this corporation, have held the position of vice president and general manager during the entire period of the corporation's activities with the United States Government until some months ago, when I became president and general manager.

Senator FRELINGHUYSEN. Is this George W. Goethals Gen. Goethals?

Mr. HOUSTON. Yes, sir. This management contract has recently been made to extend to a period of six months subsequent to the conclusion of the war, so that the ownership of the corporation, unless this management contract is overthrown, is of relatively little importance in the conduct of the corporation's affairs.

Senator FRELINGHUYSEN. I understand that Gen. Goethals's connection with the company was prior to our entrance into the war.

(At this point informal discussion occurred, which the reporter was directed not to record.)

Senator FRELINGHUYSEN. Was Gen. Goethals's connection with the company known to the Government at the time he was recalled into service as an officer?

Mr. HOUSTON. It was. Gen. Goethals at that time was president of the Wright-Martin Aircraft Corporation, and he resigned the presidency shortly after he entered the Army as Acting Quartermaster General.

Senator FRELINGHUYSEN. Has Gen. Goethals any interest in the stock of the company?

Mr. HOUSTON. I can not say as to his personal interests, but I do not think so.

Senator FRELINGHUYSEN. Do you know whether any official of the Government or anyone representing the Government other than Gen. Goethals is interested in the stock?

Mr. HOUSTON. No one that I know of.

Senator FRELINGHUYSEN. How is the corporate stock of your company held?

Mr. HOUSTON. There are 1,000,000 no-part shares of common stock authorized, of which 900,000 shares are outstanding. Our stock books show that there are between 4,000 and 5,000 separate stockholders. The stock is widely distributed throughout the country. There are 50,000 shares of preferred stock at \$100 per share outstanding. The biggest single block of this is held by Hayden, Stone & Co., bankers, of New York and Boston, who were one of the original underwriters at the time the corporation was financed.

Senator FRELINGHUYSEN. Is Col. Thompson interested in the company?

Mr. HOUSTON. Not that I know of.

Senator FRELINGHUYSEN. I believe that is all I have to ask you. We thank you very much for coming.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JUNE 19, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON
MILITARY AFFAIRS,
Plainfield, N. J.

The subcommittee met in the office of the Standard Aircraft Corporation, Plainfield, N. J., at 10 o'clock a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. L. G. RANDALL.

The CHAIRMAN. Mr. Randall, how many machines have you built for the Government up to date?

Mr. RANDALL. 750, and spare parts for 1,200.

The CHAIRMAN. What is the character of the machines?

Mr. RANDALL. J.-1 training.

The CHAIRMAN. Using the Hall-Scott engine?

Mr. RANDALL. Using the Hall-Scott engine; yes, sir.

The CHAIRMAN. When was the first machine delivered?

Mr. RANDALL. The first machine was delivered a little in advance of the 1st of August, but we really began production about that time. Then there was a period before the second. I have a book record that will show you the exact date. We had not delivered but two or three machines before the 1st of August. The last one was delivered approximately the 1st of May.

The CHAIRMAN. So that between the 1st of August and the 1st of May you delivered to the Government about 750 training planes?

Mr. RANDALL. Yes, sir.

The CHAIRMAN. Did you have any interference with production coming from the aviation authorities at Washington?

Mr. RANDALL. No.

The CHAIRMAN. Any changes in plans and specifications, or anything of that sort?

Mr. RANDALL. There were no changes required by them particularly. We had some changes that held us back some, but they were necessary changes.

The CHAIRMAN. Since the 1st of May, when you delivered the last training planes, what work have you been doing?

Mr. RANDALL. Spare parts and spare wings.

The CHAIRMAN. What does your work consist of now?

Mr. RANDALL. We still have spare parts to get out.

The CHAIRMAN. You have no contract with the Government?

Mr. RANDALL. We have one for the "M" defense machine, for which the order has not yet been received.

The CHAIRMAN. The work you are now doing is in anticipation of another Government contract?

Mr. RANDALL. Yes, sir.

The CHAIRMAN. And not upon the contract itself?

Mr. RANDALL. That is right.

The CHAIRMAN. What was your force numerically at the time the contract with the Government was completed?

Mr. RANDALL. The last count I had made, including the office, was 1,080. That was before the slump.

The CHAIRMAN. Since that time it has been what?

Mr. RANDALL. 400 now.

The CHAIRMAN. So that you have cut it down about 60 per cent?

Mr. RANDALL. Yes, sir.

The CHAIRMAN. That is due to what?

Mr. RANDALL. To the things I have spoken to you about.

The CHAIRMAN. Outside of the Government, what other customers, if any, have you?

Mr. RANDALL. At present there is a contract for ten Japanese machines.

The CHAIRMAN. That is from the Government?

Mr. RANDALL. Those machines are being held back apparently because this Government has no release motors. I think we are not actually working on them.

The CHAIRMAN. Your performance of that contract is dependent upon the demands of our own Government for space?

Mr. RANDALL. No.

The CHAIRMAN. Why are you holding back?

Mr. RANDALL. Because we have no motors. The motors have to be released by the United States Government for the use of the machine.

The CHAIRMAN. What motors do you expect to use?

Mr. RANDALL. The Hispano-Suiza.

The CHAIRMAN. Are they fighting or training machines?

Mr. RANDALL. Training.

The CHAIRMAN. Have you any other customers besides the Government?

Mr. RANDALL. No others.

The CHAIRMAN. Has the reduction of your force by 60 per cent been due to the absence of Government work?

Mr. RANDALL. Absolutely.

The CHAIRMAN. Suppose you got a contract tomorrow or that you should get one in the near future, would it be possible to increase your working force? In the event you should get a Government contract, how long would it take to restore the working force to what it was in May?

Mr. RANDALL. We are restoring it now. The new machine is just going into the shop, or the parts are going into the shop. The company has gone ahead without a positive order from the Government and is taking the responsibility of putting the parts in production, so that we are just going into the shop now.

The CHAIRMAN. You are increasing your force at present in anticipation of further Government orders?

Mr. RANDALL. No. We will shortly, as soon as the parts come.

The CHAIRMAN. Can you get good men?

Mr. RANDALL. We will not get the best men. Of course, the 400 that we have held onto are the best men. Some were transferred to the Elizabeth plant.

Senator FRELINGHUYSEN. Where did these 600 men that you lost go?

Mr. RANDALL. Part, as I say, were transferred to the Elizabeth plant. The rest went elsewhere.

The CHAIRMAN. They would naturally seek work elsewhere. Those were lost permanently. What percentage do you think you have lost permanently?

Mr. RANDALL. Fifty per cent of the 60 per cent.

The CHAIRMAN. Or 30 per cent of the whole?

Mr. RANDALL. It would run about 400 men.

Senator FRELINGHUYSEN. During the time of your completion of the contract which you were working on what efforts, if any, did you make to get additional contracts?

Mr. RANDALL. I can not answer that question because it was not handled by me.

Senator FRELINGHUYSEN. That is a matter that Mr. Mingel would know about, is it?

Mr. RANDALL. Exactly.

Senator REED. Will you permit me to ask a question right here?

Senator FRELINGHUYSEN. Certainly.

Senator REED. What was this order that you worked on? What was this order that you worked on? What was the amount of the order?

Mr. RANDALL. We had three.

The CHAIRMAN. We went into that.

Mr. RANDALL. We had first an order for——

The CHAIRMAN (interposing). The total order was for 750 in August, and the last one was delivered in May.

Mr. RANDALL. Those were the three orders.

Senator REED. I understand.

The CHAIRMAN. I may not be using the exact terms, but I want to inquire regarding the pieces generally made of bamboo underneath the wings.

Mr. RANDALL. The wing skids.

The CHAIRMAN. Of what material were the wing skids made?

Mr. RANDALL. Rattan.

The CHAIRMAN. Have you ever used gas pipe?

Mr. RANDALL. Not on these machines.

The CHAIRMAN. On any training machines?

Mr. RANDALL. Not on my work—nothing but rattan.

The CHAIRMAN. Do you know of their being used?

Mr. RANDALL. I would not call it gas pipe. They have used tubing.

The CHAIRMAN. Metallic tubing?

Mr. RANDALL. Yes, sir.

The CHAIRMAN. Who has used those?

Mr. RANDALL. I can not answer that question. I just know it from hearsay.

The CHAIRMAN. You have not used tubing with any? Where say gas pipe, I mean tubing.

Mr. RANDALL. No, sir.

Senator REED. Your orders, up to date, have been for about 75 machines?

Mr. RANDALL. Yes, sir.

Senator REED. Did you get that all in one order or three orders?

Mr. RANDALL. Three orders.

Senator REED. How far were they apart?

Mr. RANDALL. Well, the orders were issued before the work on the preceding order had been finished. We never had a gap.

Senator REED. I want to know the greatest number of machines you had ordered at any one time.

Mr. RANDALL. Five hundred.

Senator REED. How many machines did you produce per day, on an average?

Mr. RANDALL. Do you want the maximum or the average?

Senator REED. Give the maximum and the average.

Mr. RANDALL. Forty-three in two days and parts of two nights was the highest production. Our average production, the highest average production, was eight per day.

Senator REED. If you had been given an order for two or three thousand machines, could you have produced more machines daily?

Mr. RANDALL. Easily.

Senator REED. Why could you do that?

Mr. RANDALL. Because we would have been justified in ordering parts outside and could have produced in larger quantities.

Senator REED. Would you have created a larger working force in the factory?

Mr. RANDALL. Yes, sir.

Senator REED. Would you have put in more machines?

Mr. RANDALL. We did not use machinery. This was entirely assembling work.

Senator REED. You would have put in more help?

Mr. RANDALL. We would have put in more help and we would have worked two shifts on all work.

Senator REED. The order you have in prospect is for how many?

Mr. RANDALL. Four hundred and fifty.

Senator REED. If you were given an order for two or three thousand machines, what would be the effect on your ability to produce more rapidly?

Mr. RANDALL. I would guarantee a production of 20 per day.

Senator REED. A production of 20 per day?

Mr. RANDALL. And a possibility of more by working two shifts. Twenty per day would be the regular working-day period.

Senator REED. Has the Government made any complaint of the character of the work?

Mr. RANDALL. No, sir. On the contrary I have heard a great many compliments about the machines.

Senator REED. What are the machines you have worked on?

Mr. RANDALL. The J-1, preliminary training.

Senator REED. Are you capable of working on these battle planes?

Mr. RANDALL. Not on assembling. The factory is not adapted to it. They are large machines.

Senator REED. Are you limited to training planes?

Mr. RANDALL. No, sir. We could build scout machines.

Senator REED. What I want to get is this. Is your working capacity limited to training planes, or can you make other varieties of machines?

Mr. RANDALL. We can, provided they are not too large. We can not build extremely large machines.

Senator REED. Can you build the De Haviland four?

Mr. RANDALL. No, sir.

Senator REED. Have you room for the Spad?

Mr. RANDALL. I think we have.

Senator REED. What I want to get at is this, to be perfectly frank about it: The Government has enough training planes for the present, so it is said. I am going to assume that is true. You are speaking about not having a sufficient amount of work. Of course, that involves the question whether or not you can make the character of plane that the Government now needs. If they have training planes, it necessarily follows that the only character of plane they need is something in the nature of a fighting plane, a bombing plane, or something along that line.

Mr. RANDALL. We are limited, as Mr. Masters will tell you, by our floor space. We can build any planes where the wing spread is not much in excess of the J-1 machine, which is about 45 feet. Of course, the smaller the machine the more we can turn out. The plant is admirably adapted to the scout machine. We can turn that out in quantity production.

Senator FRELINGHUYSEN. The Spad and the S. E.-5.

Mr. MASTERS. We can build those machines.

Senator FRELINGHUYSEN. What is your position?

Mr. MASTERS. I am assistant to the President and in charge of this plant.

Senator FREHLINGHUYSEN. At your other plant you can build all character of machines?

Mr. MASTERS. Oh, yes, sir. We are building De Haviland machines now. We are also building the Handley Paige, and some Capronis, the S. H. 1, and the L. Boat.

Senator FRELINGHUYSEN. What I am trying to get at is whether or not the Government is really availing itself of the capacity of these plants. Of course, that involves two things: What is the capacity of the plant and what are the necessities of the Government? Let me see if I can clear it up in this way. The Standard Aircraft Corporation is one corporation, with a plant in Elizabeth which has large facilities, and this plant here, with limited facilities; is that so?

Mr. MASTERS. We operated here originally on the training planes. This plant was not large enough to manufacture or fabricate the parts and assemble as well, so we took the plant in Elizabeth and made that the main plant, manufacturing the parts there and shipping them here for assembly. Of the training planes we turned out in eight months 750 with a thousand spares.

The CHAIRMAN. That was here?

Mr. MASTERS. That was here, in the assembling.

Senator FRELINGHUYSEN. What I am trying to get at is this: This is really an auxiliary plant with the main plant at Elizabeth. If that plant were run to capacity the overflow would come here?

Mr. MASTERS. Yes, sir.

Senator FRELINGHUYSEN. If that plant had sufficient orders, this plant could be utilized for any excess?

Mr. MASTERS. Yes, sir; that is right.

Mr. RANDALL. Except that we could not utilize it for excess with regard to any of those big planes.

Mr. MASTERS. If we had large orders for De Haviland machines, for example, we could do the subassembling here, such as making the wings, and things of that kind, and do the final assembling at Elizabeth.

Senator REED. How far is that away?

Mr. RANDALL. About 12 miles.

Mr. MASTERS. I do not know whether Mr. Randall explained that we had a thousand hands here.

Senator REED. Yes; we got that information.

Senator FRELINGHUYSEN. In other words, you have a greater capacity than you are at present utilizing?

Mr. RANDALL. Absolutely.

Senator FRELINGHUYSEN. And you need orders. You could do more work if you had orders?

Mr. MASTERS. I might state, as an example, that as to this training plane that we are now building, which is really a one-man fighting proposition, or scout plane, we have an order for 450.

Senator FRELINGHUYSEN. From whom?

Mr. MASTERS. The Signal Corps.

Senator FRELINGHUYSEN. What plane is that?

Mr. MASTERS. That is the scout plane.

Senator FRELINGHUYSEN. Who designed that?

Mr. MASTERS. It is a design of our own, accepted and approved by the Government, and flown by the French and English flyers here in this country.

The CHAIRMAN. I understand, Mr. Randall, that you have not an order, but that you are working in anticipation of one.

Mr. RANDALL. The order has been given to us. We know that, but we have no contract. The Navy called up and said to deliver the first 10 of the first type.

Senator REED. You got this plane up yourselves?

Mr. MASTERS. Yes, sir.

Senator REED. Has it ever been tested on the battle front?

Mr. MASTERS. No; but it is on the lines of the English S. E. 5. It is on the same lines as that plane. It has been approved by French and English flyers who were here to assist our Government.

Senator REED. How many have been made of them?

Mr. MASTERS. Two have been made and flown.

Senator REED. And on that they have given an order for 450?

Mr. MASTERS. Yes, sir.

Senator REED. With what engines?

Mr. MASTERS. The Gnome and Le Rhone.

Senator REED. What is the horsepower of those machines?

Mr. MASTERS. Eighty horsepower.

The CHAIRMAN. They are rotary engines?

Mr. MASTERS. Yes, sir.

The CHAIRMAN. Who actually designed the machine?

Mr. RANDALL. Mr. Day and Mr. Huff.

The CHAIRMAN. Does this machine only carry one man?

Mr. RANDALL. One man.

The CHAIRMAN. What is its speed?

Mr. RANDALL. One hundred and twenty-five miles per hour, I think.

The CHAIRMAN. With each one of those engines?

Mr. RANDALL. The only engine we have tried is the Gnome.

The CHAIRMAN. You never tried it with the Le Rhone?

Mr. RANDALL. We tried one at Mineola with the Le Rhone.

The CHAIRMAN. What is the weight of the Gnome engine?

Mr. RANDALL. I can not answer that.

The CHAIRMAN. What is the weight of the Le Rhone engine?

Mr. RANDALL. I can not answer that.

The CHAIRMAN. What are the advantages claimed for this machine?

Mr. RANDALL. Ease of handling, and its speed.

The CHAIRMAN. Does it carry bombs?

Mr. RANDALL. No, sir. It carries gun mounts, and it is to be used for advanced training. Instead of a gun it can carry a photographic machine.

Mr. MASTERS. As I understand it, it is optional whether they carry a photographic machine or a gun. Whether there is a gun mount or a camera mount, as I understand it, is optional with the Government. As I understand it, it is to be used for scout purposes and for observation. In case it is attacked, it is protected with a gun.

The CHAIRMAN. You say it is built on the lines of what machine?

Mr. MASTERS. The S. E. 5.

The CHAIRMAN. What is the advantage of this machine over the S. E. 5?

Mr. MASTERS. I can not answer that question.

The CHAIRMAN. Have you anybody that can tell us?

Mr. MASTERS. Yes.

The CHAIRMAN. Where are those rotary machines being manufactured?

Mr. MASTERS. The Signal Corps supplies those.

The CHAIRMAN. You do not know where they get them?

Mr. MASTERS. My recollection is one factory is at Long Island and one at Pittsburgh. Those we order from the Signal Corps.

The CHAIRMAN. Have you one of those machines of your own design that we can see?

Mr. RANDALL. We have one. It has been sand tested.

The CHAIRMAN. Where do you send it for the sand test?

Mr. RANDALL. At our own plant, under the supervision of an Army officer.

Senator FRELINGHUYSEN. Do you know where the Gnome and the Le Rhone engines are being manufactured?

Mr. RANDALL. I think one of the Gnome engines is being built at Long Island City. The Le Rhone is being built at Pittsburgh. Mr. Huff can give you the names of the companies manufacturing them. I was present at the test of the M defense machine and it was highly praised by the French and English flyers.

STATEMENT OF MR. THOMAS HENRI HUFF.

Senator REED. Are you the designer of the machine that is being made here called the "M defense" machine?

Mr. HUFF. Model E-1; yes, sir.

Senator REED. What did you model it after; what plane did you follow?

Mr. HUFF. Merely the general type of small pursuit plane—the Nieuport type. It is a French machine.

Senator REED. What was the horsepower of the engines that you did not get?

Mr. HUFF. One hundred and sixty.

Senator REED. That made a great deal of difference in your calculations, did it not?

Mr. HUFF. Only in performance. We did not contemplate putting the machine out as a fighter with the 100-horsepower Gnome motor in it. We put it in in order to get a relative performance.

Senator REED. What was the name of the motor besides the Gnome?

Mr. HUFF. It was the Le Rhone.

Senator REED. The other was the Le Rhone?

Mr. HUFF. Yes, sir.

Senator REED. You expected to have a 160-horsepower Gnome motor, and you got a 100-horsepower motor?

Mr. HUFF. Yes, sir.

Senator REED. What was the difference in weight?

Mr. HUFF. The 160-horsepower motor is supposed to be eight pounds lighter than the 100-horsepower motor.

Senator REED. It must be quite a different type of engine?

Mr. HUFF. It is the same type, but merely improved.

Senator REED. And with that one you expected to carry guns on the wings?

Mr. HUFF. Sixteen guns. They are very small guns.

Senator REED. About how large?

Mr. HUFF. About that long [indicating].

Senator REED. When you say "about that long" you indicate about a foot?

Mr. HUFF. Yes, sir.

Senator REED. As a matter of fact, you never did employ those guns?

Mr. HUFF. At the time we finished the machines they were not ready to employ.

Senator REED. What about the Le Rhone engine?

Mr. HUFF. The Le Rhone engines are put in because the Gnome engine is not available in sufficient quantity to go into production.

Senator REED. Can you get enough of the Le Rhone?

Mr. HUFF. As I understand it, there is an order with the Union Switch & Signal Co. for a large quantity production. They claim 20 a day, I believe.

Senator REED. What is the weight of the Le Rhone as compared with the Gnome?

Mr. HUFF. About 25 pounds less.

Senator REED. What is the horsepower?

Mr. HUFF. It develops 80.

Senator REED. So the proposition is to go from the 160-horsepower to the 80-horsepower motor?

Mr. HUFF. Yes, sir.

Senator REED. That makes a difference in speed?

Mr. HUFF. Yes; about 15 or 20 miles an hour. This machine was originally designed for rapid climbing and not for speed.

Senator REED. What is the speed of the plane with the Le Rhone engine?

Mr. HUFF. There has been no official test.

Senator REED. What do you estimate it to be?

Mr. HUFF. Between 90 and 100 miles.

Senator REED. What would it be if you had the Gnome?

Mr. HUFF. Between 125 and 135 would be a safe estimate.

Senator REED. What tests were made?

Mr. HUFF. There are no official tests for speed. The machine has been carefully tested for maneuvers.

Senator REED. By whom?

Mr. HUFF. The first test was made by our own pilot at Hampton. The second test was made on the second machine in Washington at the Polo Field, by Col. Jones. The third test was made at Mineola by Capt. Roger Jannis.

Senator REED. With which engine?

Mr. HUFF. With the Le Rhone. The other two tests were made with the 100-horsepower Gnome.

Senator REED. Tell the engine that you used in each of the tests?

Mr. HUFF. Going back to the first test, the first one was made at Hampton, with a 100-horsepower Gnome; the second test was made at Washington, with a 100-horsepower Gnome; the third test was made at Mineola, with the 80-horsepower Le Rhone; the fourth test was made at Mineola, with the 80-horsepower Le Rhone.

Senator REED. And what was the engine that you really wanted for the machine?

Mr. HUFF. The 160-horsepower Gnome.

Senator REED. And what is the reason you could not get that engine?

Mr. HUFF. Because they are not making them.

Senator REED. Are not making them?

Mr. HUFF. No; they are not getting them into quantity production.

Senator REED. Who was to make them?

Mr. HUFF. The General Vehicle Co.

Senator REED. Do you know why they refused to make them?

Mr. HUFF. I do not think there was any refusal on their part. I do not know the details. There was great difficulty in building the Gnome motor.

Senator REED. Why?

Mr. HUFF. Because it is a delicate piece of machinery. It is not a production proposition?

Senator REED. Just what do you mean by that?

Mr. HUFF. You can not build 20 a day, but you can probably build 2 a day. That is my understanding. I am not a manufacturer of motors.

Senator REED. You understand that the engine for which this machine was originally designed has been abandoned?

Mr. HUFF. In this country. They are still building them in France and using them at the front.

Senator FRELINGHUYSEN. Are the General Vehicle Co. building the Hispano-Suiza?

Mr. HUFF. I do not know.

Senator FRELINGHUYSEN. Are they substituting that for the Gnome production?

Mr. HUFF. I do not know.

Senator REED. Could you use a 300-horsepower Hispano-Suiza in this fuselage?

Mr. HUFF. No, sir. We could use 150.

Senator REED. Have you tried that?

Mr. HUFF. We have a design worked out. I expect to do that within a month or so.

Senator REED. Then that is a matter of experimentation?

Mr. HUFF. Yes, sir.

Senator REED. It would not be safe to say that you can fit it in this machine.

Mr. HUFF. Only from a general standpoint.

Senator REED. How does the weight compare?

Mr. HUFF. With the addition of the radiator required on the 150-horsepower water-cooled Hispano, the weight would probably run 550 to 600 pounds.

Senator REED. What was the weight of the other?

Mr. HUFF. The weight of the air-cooled machine or motor would be about 310 pounds.

Senator REED. Then, necessarily, you have to make allowance for that in the flying machine itself?

Mr. HUFF. The machine as designed at present would carry the extra weight.

Senator REED. Will it carry it?

Mr. HUFF. Yes, sir.

Senator REED. How did you come to give to a machine the capacity to carry 200 pounds more of weight than you needed in it?

Mr. HUFF. When you design a machine to carry a certain amount of weight it has a certain landing speed. If you put in more weight you increase the landing speed. On the highly powered machines they would be willing to sacrifice some of the landing speed.

Senator FRELINGHUYSEN. It would become nose-heavy?

Mr. HUFF. No. You would merely have a faster landing.

Senator REED. I do not quite catch that.

Mr. HUFF. With the highly powered machines they are willing to make a sacrifice. The flyers of the powerful machines do not mind that.

Senator REED. You mean that if they come close to the ground—

Mr. HUFF (interposing). They can pull themselves out if they are going to make a landing.

Senator REED. With their powerful engines they can lift themselves again and that compensates for the increased speed of landing?

Mr. HUFF. Yes, sir. The high-speed landing is not dangerous, provided you have power to pull you up.

Senator REED. But, as a matter of fact, while you have built 750 of these machines, you have never been able to get the engines?

Mr. HUFF. Oh, that is a different machine.

Mr. MASTERS. The 750 machines were training planes, Senator. That is a two-man machine.

Senator REED. You have been speaking of the machines that you have an order for?

Mr. HUFF. Yes, sir.

Senator REED. And you have not got the right type of engines?

Mr. HUFF. We have since they are using them for training planes.

Senator REED. But if you had the right type of engine you could use them for combat planes?

Mr. HUFF. Yes, sir.

Senator REED. All you need is the Hispano-Suiza engine to do that?

Mr. HUFF. We would have a very much improved training plane with the Hispano-Suiza engine, with the possibility of a fighting plane.

Senator FRELINGHUYSEN. You mean a probability of a fighting machine?

Mr. HUFF. At least training machines that would be similar in performance to the English S. E. 5's and probably better than the S. E. 5's.

Senator REED. But you would not be willing to guarantee it as a fighting plane?

Mr. HUFF. No, sir.

Senator REED. You started originally to make a fighting plane?

Mr. HUFF. Yes, sir; with 160-horsepower rotary motor for the fighting plane.

Senator REED. And you could not get the motor?

Mr. HUFF. No, sir; we could not get the motor.

Senator REED. If you had a 300-horsepower Hispano-Suiza motor, could you put it in the plane?

Mr. HUFF. No, sir.

Senator REED. If you had a 180-horsepower Hispano-Suiza motor, could you make a fighting plane?

Mr. HUFF. Yes, sir.

Senator REED. So that the thing you are up against is a lack of motors?

Mr. HUFF. Yes, sir.

Senator REED. You started to make a fighting plane in which you needed a 160-horsepower Gnome motor and you could not get it?

Mr. HUFF. That is right.

Senator REED. Because it is not a thing of quantity production?

Mr. HUFF. That is right.

Senator REED. Then they switched you to the Hispano-Suiza, which reduces you from a fighting plane to a training plane?

Mr. HUFF. Yes, sir.

Senator REED. But if you could get the 180-horsepower Hispano-Suiza, you think you could make a fighting plane?

Mr. HUFF. Yes, sir.

Senator REED. With what capabilities?

Mr. HUFF. A better machine than the S. E. 5 and the Spad.

Senator REED. That is somewhat theoretical, because you have not had a chance to try it out with those motors?

Mr. HUFF. Yes, sir.

Senator REED. You would not be willing to go into quantity production until you had an engine of that kind.

Mr. HUFF. Absolutely. That must be done.

Senator REED. Therefore, because you have not had an engine of that kind, to test it out, you propose now to go into the creation of training planes?

Mr. HUFF. Yes, sir; absolutely.

The CHAIRMAN. With rotary engines?

Mr. HUFF. Yes, sir.

Senator REED. Have you tried to get an engine suitable for a fighting plane outside of the attempts you have made to get the Gnome?

Mr. HUFF. Yes, sir.

Senator REED. You have not asked the Government to furnish you the Hispano-Suiza?

Mr. HUFF. Yes, sir.

Senator REED. You have asked that?

Mr. HUFF. Yes, sir. We can get the 150 Hispano at any time. I doubt very much if we can get the 180-horsepower motor. I am told that the Hispano-Suiza at the present time is allotted to other companies; that all of the production of the Hispano-Suiza motor is taken care of.

Senator REED. Is France getting some of them?

Mr. HUFF. Yes, sir.

Senator REED. You spoke about the 16 guns that were to go on the wings of this machine when you originally planned it as a fighter.

Mr. HUFF. Yes, sir.

Senator REED. What was the name of the gun?

Mr. HUFF. The Revelle gun.

Senator REED. Have you ever seen this gun?

Mr. HUFF. I have only seen the drawings of them.

Senator REED. You have been working from a drawing?

Mr. HUFF. We have a drawing of the gun and have made an arrangement on the wing to mount this gun.

The CHAIRMAN. When you designed this machine, did you have any assurance from the Government that it could give you the Gnome engine?

Mr. HUFF. The machine was designed by Col. Clark.

The CHAIRMAN. Who is he?

Mr. HUFF. He was in the engineering department at McCook field.

The CHAIRMAN. Did he give any assurances that the Government would furnish the engine?

Mr. HUFF. It was his belief that the engine would be ready.

The CHAIRMAN. That does not answer the question. Did you have any assurance that you could be supplied with the engine?

Mr. HUFF. I went over to the General Vehicle Co. I talked to the president about it. He said it would require about three months to build one motor upon the receipt of the material required in that motor.

The CHAIRMAN. At that time did the General Vehicle Co. have a contract with the Government for the manufacture of 160-horsepower motors?

Mr. HUFF. I do not know that.

The CHAIRMAN. You did not ask that?

Mr. HUFF. I do not know that.

Senator FRELINGHUYSEN. You spoke of this plane you have designed being similar to the Nieuport? The Nieuport is a very sensitive machine, is it not?

Mr. HUFF. Yes, sir.

Senator FRELINGHUYSEN. You said it was better than the Spad and the S. E. 5. Is it as stable as those machines.

Mr. HUFF. It is as stable and less sensitive.

Senator FRELINGHUYSEN. As I understand it, the Nieuport is not used as extensively as the S. E. 5 and the Spad.

Mr. HUFF. It is not being used on account of the motor. It is not because of its sensitiveness. I think the Moran-Sonia is the machine that you have reference to, Senator.

Senator FRELINGHUYSEN. I understood that they were abandoning the Nieuport.

Mr. HUFF. Only because they were being outpowered; that is all.

Senator REED. You have just stated to me informally in a conversation that there have been trouble and accidents growing out of the fact that the linen on the wings of airplanes has been stretched too highly. What is the remedy for that?

Mr. HUFF. It is more careful inspection.

Senator REED. What is the remedy for careless inspectors?

Mr. HUFF. A school for inspectors at which they will learn absolutely what is right, and not get the question of absolute right mixed up with their own theories. At the present time the inspectors go to school at the different plants and learn by experience, observation, and teaching from their superiors. Consequently, ideas sometimes are absorbed which are not accurate, and that, in my opinion, is a reason why there should be a school for inspectors at which all would be taught absolutely correct principles. It might be well to add that the school might be similar in type to our ground schools.

Senator FRELINGHUYSEN. I should like to have your observations on the spruce situation. I understand you have made a study of it. The difficulty seems to be to secure enough spruce for the manufacture of planes, thus forcing the manufacturers of planes to splice the parts.

Mr. HUFF. It is more to get the inspection department to realize the scarcity of spruce and the advisability of using spliced members in place of perfect pieces of spruce unspliced. We could use shorter lengths of spruce if we were allowed to splice them.

Senator REED. Do you think it is as safe?

Mr. HUFF. It is necessary when splices are employed to sacrifice something in the weight of the machine. This, however, when we are considering the training planes, is not so important a factor as the ability to secure perfect members unspliced. At the present time rejections on our spruce are still excessively large, and it should be brought out more clearly among the inspectors just how important a point it is that we utilize every available bit of material so as to conserve the material of the more perfect character for our fighting machines.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JUNE 19, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Elizabeth, N. J.

The subcommittee met in the offices of the Standard Aircraft Corporation. Elizabeth, N. J., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. HARRY B. MINGLE, PRESIDENT OF THE STANDARD AIRCRAFT CORPORATION.

The CHAIRMAN. What is the name of your company?

Mr. MINGLE. The Standard Aircraft Corporation.

The CHAIRMAN. What is your connection?

Mr. MINGLE. I am president.

The CHAIRMAN. What is the capitalization of the company?

Mr. MINGLE. The authorized capitalization is \$5,000,000.

The CHAIRMAN. How much is paid up?

Mr. MINGLE. I will have to refresh my memory.

The CHAIRMAN. When was it organized?

Mr. MINGLE. In November, 1917.

The CHAIRMAN. For what purpose?

Mr. MINGLE. Building of aircraft.

The CHAIRMAN. For the United States Government?

Mr. MINGLE. For the United States Government and the allies. If I may interrupt so that the record may be clear, there was the Standard Aero Corporation, which is the parent company, and is our engineering development company now.

The CHAIRMAN. It is still a separate corporation?

Mr. MINGLE. It is a separate corporation.

The CHAIRMAN. What is its capital?

Mr. MINGLE. Its capital is \$500,000, with \$300,000 of stock issued.

The CHAIRMAN. When was it organized?

Mr. MINGLE. That company was organized in May, 1916.

The CHAIRMAN. What for?

Mr. MINGLE. For the building of aircraft.

The CHAIRMAN. Is it engaged in the building of aircraft?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. Where is its plant or plants?

Mr. MINGLE. At Plainfield, N. J.

The CHAIRMAN. How much of a plant did it have?

Mr. MINGLE. When we started out there was a very small brick building of about 22,000 or 24,000 square feet.

The CHAIRMAN. Did you enlarge that plant? If so, state it briefly.

Mr. MINGLE. We enlarged the plant very largely during the summer of 1916. We increased it to about 110,000 square feet.

The CHAIRMAN. What planes do you manufacture?

Mr. MINGLE. When the company was organized we were building what was then known as the H-3 plane, which was, I presume, what would be termed, or was termed at that time, the reconnoissance type.

The CHAIRMAN. Who was it that you built it for?

Mr. MINGLE. The Signal Corps.

The CHAIRMAN. Of the United States Army.

Mr. MINGLE. Of the United States Army; yes, sir.

The CHAIRMAN. You say the reconnoissance type. Would that be what you would call a training plane?

Mr. MINGLE. At that time it was what we would have called a training plane. Is that correct, Mr. Day?

Mr. DAY. It originally was designed as a reconnoissance machine. That was at a time when the fighting planes were practically nonexistent, and it was considered at that time as a reconnoissance machine for the purpose of observation and general reconnoissance.

The CHAIRMAN. Do you wish to go on with the examination, Senator Reed?

Senator FRELINGHUYSEN. I would like to ask a question. What is the relation between the Standard Aero Co. and the Standard Aircraft Production Co.

Mr. MINGLE. They are two independent organizations, the Aero Corporation being the original company. On November 1, when we went on the cost-plus basis, it seemed advisable for us to have an organization for experimental work and not have it complicated with production work, so we organized and put into effect the Aircraft Corporation, which then became the production company, the Aero Corporation confining itself, for a period of time—a considerable period of time, and until quite recently—to what we call experimental work.

Senator FRELINGHUYSEN. Is this a holding company for the other?

Mr. MINGLE. Not at all.

Senator FRELINGHUYSEN. Are they owned by the same interests?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. Who controls the company?

Mr. MINGLE. The entire stock is issued to myself. The financing of this proposition has been and is being done by Mitsui & Co., a Japanese corporation. Mitsui & Co. occupy a position that is similar to that of Morgan or Rockefeller in this company.

Senator FRELINGHUYSEN. Is that Mitsui Co. a banking firm connected in any way with the Japanese Government?

Mr. MINGLE. Not to my knowledge.

Senator FRELINGHUYSEN. Then the company is owned by Japanese interests?

Mr. MINGLE. The stock is entirely owned by myself. The money has been loaned to me. When the Aircraft Corporation was formed, the preferred stock which was issued was issued in my name and by

me transferred as collateral for the holdings which I had in the company until the money was paid back to Mitsui & Co. If the company makes good, eventually the stock will be in the hands of myself and the men associated with me.

Senator FRELINGHUYSEN. Did you borrow money from Mitsui Bros. to finance the company?

Mr. MINGLE. Yes, sir. The money was borrowed by me individually and invested in the company.

Senator FRELINGHUYSEN. What was the nature of the transaction—notes, with stock as collateral?

Mr. MINGLE. There is nothing of that kind. It is a very extraordinary transaction. Mitsui & Co. have simply placed their confidence in me and all that they have is a memorandum so that in case I should die or anything should happen they could handle it in any way they wished.

Senator FRELINGHUYSEN. If you fail in the payment of your interest or liquidation of the notes——

Mr. MINGLE. There is no obligation whatsoever.

Senator FRELINGHUYSEN. Those notes are collateral notes?

Mr. MINGLE. There are no notes of any kind.

Senator THOMAS. You must have some written agreement.

Mr. MINGLE. Simply a written agreement that if we pay them back all the stock is canceled and the common stock becomes my property.

Senator REED. What stock is canceled?

Mr. MINGLE. The preferred stock.

Senator REED. Where is that?

Mr. MINGLE. In the hands of Mitsui & Co.

Senator REED. How much is that?

Mr. FINKELSTEIN. About \$2,000,000.

Senator REED. You heard his answer, Mr. Mingle. Is that correct?

Mr. MINGLE. That is correct.

Senator REED. How much money did you borrow?

Mr. MINGLE. \$2,000,000.

Senator REED. You put up the \$2,000,000 of the preferred stock in this company, which they hold?

Mr. MINGLE. Yes, sir.

Senator REED. How much preferred stock is there?

Mr. MINGLE. \$2,000,000.

Senator REED. They hold all the preferred stock?

Mr. MINGLE. They hold all the preferred stock.

Senator REED. That guarantees what dividend?

Mr. MINGLE. Eight per cent.

Senator REED. If the 8 per cent is not paid upon the preferred stock, what then?

Mr. FINKELSTEIN. It is cumulative.

Senator REED. Suppose it is not paid at all?

Mr. MINGLE. I personally would be relieved from any obligation and Mitsui & Co. would take their loss.

Senator REED. But they would also take the company under the preferred stock?

Mr. MINGLE. I presume they would; yes, sir.

Senator REED. I want to get the condition of the preferred stock. The condition as to the preferred stock, broadly speaking, is this: It shall pay 8 per cent., cumulative, and the value of the stock itself shall be satisfied out of the assets of the company, and then everything goes to the common stock?

Mr. MINGLE. Yes, sir.

Senator REED. Does the preferred stock have voting power?

Mr. MINGLE. No, sir.

Senator REED. Have you here a share of the preferred stock?

Mr. MINGLE. I have a certificate book.

Senator REED. How did you come to make an arrangement with this Japanese firm?

Mr. MINGLE. I have been an attorney for Mitsui & Co. for a number of years.

Senator REED. What has been their business?

Mr. MINGLE. They are a commission house.

Senator REED. Just what do you mean by that?

Mr. MINGLE. Buying and selling.

Senator REED. What?

Mr. MINGLE. Principally silk and oriental materials and oil. Their business in this country was built up entirely in the silk trade.

Senator REED. When was it that you first talked with them about going into the airplane business?

Mr. MINGLE. I was an attorney for the Mitsui Co. Along about February, 1916, one of the representatives of Mitsui & Co. came to me, came to my office, and stated that they had loaned to the Sloan Manufacturing Co., or to John E. Sloan, certain moneys and that they had no security for the moneys, and they asked me to arrange to have them properly secured. The Sloan Manufacturing Co. was then engaged in the building of airplanes and cabinets for the Edison Co. Mr. Sloan was president of the company at that time.

The CHAIRMAN. You mean the Edison Phonograph Co.?

Mr. MINGLE. Yes. Mr. Sloan was the son-in-law of Mr. Edison. In the course of the negotiations it became apparent that the company was in financial straits, and Mr. Sloan retired from the company and I assumed the duties of the President in order to liquidate. I went down to Washington. They had no contracts at that time. They had done a lot of work in Plainfield. I went to Washington and had a talk with Gen. Squier who had just returned from abroad. As a result of that conference we were given an order for 12 machines of the H-3 type.

Senator REED. Sloan had been making machines?

Mr. MINGLE. They had made several machines.

Senator REED. For the Government?

Mr. MINGLE. No. They had made one for the English government, and the others were exhibition machines.

Senator REED. They had a little experience in the working of the company that you took charge of. They had a little experience in the airplane business and you went down to see what you could do in the way of getting contracts?

Mr. MINGLE. Yes. I might say that Mr. Day was chief engineer of the company at the time. He had had very considerable experience as an aeronautical engineer. He is looked upon as a real asset for

any company. I think the only asset that we had at the time was Mr. Day, absolutely. The company was bankrupt, in my opinion, at the time we took hold of it. When I got this order for 12 machines, Mitsui said they would have to finance it, and we organized the Standard Aircraft Corporation.

Senator REED. What became of the assets of the Sloan Manufacturing Co.?

Mr. MINGLE. The Sloan Manufacturing Co. assets were handled in this way. I should like, however, to have the privilege of correcting any statements that I may make, because I am making them to you entirely from memory. There has been so much of this that it is hard for me to get my memory working accurately. I did not know that we were going to go back over this.

The CHAIRMAN. We will have a stenographic record of this statement sent to you so that you can go over it and make such changes and corrections as you think are required.

Mr. MINGLE. The assets, as I recall it, which we took over, were only the work in progress, and such raw materials as they had on hand, a very small amount. The machinery equipment which they had we leased, and the lease which they had on the buildings we continued, but did not assume. That is an observation as to which I would like to refresh my memory later, if it becomes necessary.

The CHAIRMAN. You can do that.

Mr. MINGLE. What I am saying here is, in my opinion, the crux of the whole situation. I came into this as an attorney and never had seen an aeroplane until I went to the plant in April or May of 1916.

The CHAIRMAN. 1916?

Mr. MINGLE. Yes, sir. We built an airplane under the Signal Corps' directions from what we believed to be our own designs and drawings. The only reason we took the contract was that we thought we had drawings and designs from which we could build a plane. When we got into it we discovered that the drawings and designs were not production drawings and designs, and we spent the entire summer endeavoring to build up a completed machine. We finally got one to Mineola, after many weeks of struggle, endeavoring to have the engine, I might say, function properly in the machine and overcome the radiation troubles, and overcome difficulties which had not even been thought of or considered in aircraft production around these parts. When I say "around these parts" I mean around New York City, because other companies had worked in other territory, and apparently the conditions which we met in the New York territory were not the same as in the other territory.

The CHAIRMAN. Before we get off on the question of production, let me ask you one or two questions with reference to the common stock. You stated a few moments ago that all of the stock stood in your name. Did you mean the common stock?

Mr. MINGLE. The common and preferred.

The CHAIRMAN. What is the amount of the common stock?

Mr. MINGLE. Common authorized is \$3,000,000.

The CHAIRMAN. And the amount issued?

Mr. FINKELSTEIN. \$2,350,000.

The CHAIRMAN. That stock stands in your name?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. Is it in your possession?

Mr. MINGLE. Fifty-one per cent of it is in the possession of Mitsui & Co.

Senator REED. Of the common stock?

Mr. MINGLE. Yes, sir.

Senator REED. And all of the preferred?

Mr. MINGLE. All the preferred.

The CHAIRMAN. Is that 51 per cent also a part of the security? In other words, if anything happened by reason of which they would be compelled to take the plant over, would they get all the preferred stock and 51 per cent of the common?

Mr. MINGLE. If anything happened to me individually?

The CHAIRMAN. If anything happened to the company they would get that?

Mr. MINGLE. I presume if their confidence in me was shaken that they would become the holders of the company and I would retire.

The CHAIRMAN. You might die.

Mr. MINGLE. That is the reason they hold 51 per cent.

The CHAIRMAN. Have you indorsed that in blank?

Mr. MINGLE. Absolutely.

Senator REED. As a matter of fact, 51 per cent of the common stock is in the hands of Mitsui Bros. indorsed in blank?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. They can fill out the indorsement at any time they want to and thus have control of the majority of the common stock of the company, which is the voting stock?

Mr. MINGLE. They could do that.

Mr. FINKLESTEIN. There is an agreement between Mr. Mingle and Mitsui & Co. whereby that is prevented.

Mr. MINGLE. Except upon my volition. If I retired from the company, which I would do if they requested it, that would be so. I would retire in a minute if they lost confidence in me.

Senator REED. Let us go back to preferred stock. That is not the voting stock?

Mr. MINGLE. No, sir.

Senator REED. It is indorsed in blank and is in the hands of Mitsui & Co.

Mr. FINKLESTEIN. That is not Mitsui Bros., Senator. It is Mitsui & Co.

Senator REED. As a lawyer, you know that the placing of that common stock and the preferred stock indorsed in blank in their hands gives them power to fill in and transfer this to whomsoever they please, unless there is an outside agreement?

Mr. MINGLE. Yes, sir.

Senator REED. There is an agreement, so Mr. Finklestein said a moment ago. Would you mind letting us see that?

Mr. MINGLE. I think that is in my New York office. I would be glad to show it to you.

Senator REED. If it is a private matter, we will not put it in a public record.

Mr. MINGLE. No; I would not like for it to be public.

Senator REED. If it is not private, suppose you attach it to the record when it is sent to you for correction.

Mr. MINGLE. I would not want it attached to the minutes.

Senator REED. We will not make it a public property, then.

The CHAIRMAN. I would like to follow up my line of questions. Does Mitsui & Co. have a representative here outside of yourself?

Mr. MINGLE. No, sir; none at all.

The CHAIRMAN. Do these gentlemen have access to your contracts with the Government or to your methods of operation here?

Mr. MINGLE. If they wish. They have never exercised that at any time. I make that statement unqualifiedly.

The CHAIRMAN. They have power to do so?

Mr. MINGLE. Yes.

The CHAIRMAN. Have they the power also to demand copies of Government contracts from you or copies of plans or designs of machines?

Mr. MINGLE. No, sir; they have not. No one has that.

The CHAIRMAN. Suppose that the Japanese Government or Mitsui & Co., or anyone else representing them, should make such a request of you, would you feel at liberty to refuse it?

Mr. MINGLE. Absolutely.

The CHAIRMAN. Although it might result in a change of management?

Mr. MINGLE. Absolutely.

The CHAIRMAN. There is nothing, then, in the relation between your company and Mitsui & Co. that would give them the right to demand or that would justify you in giving them any of the plans, contracts, or other official data that you acquire by virtue of your contract with the United States Government?

Mr. MINGLE. No, sir.

Senator REED. But if they should lose confidence in you, that is to say, if they came to you and said, "We want such and such information," and you refused to give it——

Mr. MINGLE. I was just going to say some thing along that line.

Senator REED. They could——

Mr. MINGLE (interposing). No, sir; they could not do it so long as I am here. The only thing they could do——

Senator REED (interposing). They could exercise their rights to vote this stock. They could change the organization of the company if they saw fit.

Mr. MINGLE. That is true.

Senator REED. As I understand it, you, as a loyal citizen, if you saw something being done that was inimical to the interests of your country, might stand out against that and might, therefore, bring the matter to a breach; but as a matter of law, they have the power, if they want to use it, to force the turning over of this plant.

Mr. MINGLE. As a matter of law, I should say so.

Senator REED. Yes.

Senator FRELINGHUYSEN. How much do you own personally?

Mr. MINGLE. Forty-nine per cent.

Senator FRELINGHUYSEN. That is owned by yourself?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. They own 51 per cent, or control is pledged to them as collateral.

Mr. MINGLE. Not as collateral, but pledged to be held in case any thing happens to me. It is not collateral.

Senator FRELINGHUYSEN. And what is the preferred capitalization?

Mr. MINGLE. \$2,000,000.

Senator FRELINGHUYSEN. What is the common capitalization?

Mr. MINGLE. \$3,000,000.

Senator FRELINGHUYSEN. How much money have they loaned you on that \$5,000,000?

Mr. MINGLE. On the transaction as you have set it forth, they have loaned me \$2,000,000. Since that time, Mitsui & Co. have loaned this company an additional \$1,500,000 as a company.

Senator FRELINGHUYSEN. Then, there is \$3,500,000 of cash represented in the plant?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. Would you not feel more comfortable if you had less watered stock?

Mr. MINGLE. I would not say watered stock.

Senator FRELINGHUYSEN. I mean it is not represented by cash.

Mr. MINGLE. It is not represented by cash; it is represented by development work.

Senator FRELINGHUYSEN. Did you represent, in a legal capacity, Mitsui & Co. at any time?

Mr. MINGLE. I have been their legal representative for a number of years.

Senator FRELINGHUYSEN. In fact, you came here while their legal representative and took the title to this stock in your name and controlled the corporation, and they loaned you money to finance it?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. Would you not feel more comfortable if the control of the company were in other hands, or the loan had been made by interests connected with the United States Government, or by Americans?

Mr. MINGLE. Absolutely, but I want to say this as a matter of record, that I do not believe there is any company, man, or corporation in the world that would have done what Mitsui & Co. have done in the creation and development of this plant. I would like to have that on the record so that it may be clear.

Senator FRELINGHUYSEN. The situation, as I see it, is this: We are at war, and I should think you, as an American citizen, would feel more comfortable if the tender had been made by an American banking firm, would you not?

Mr. MINGLE. It depends on what you mean by "more comfortable". I personally do not feel that our situation could have been in any way improved or bettered had the financing been done by an American concern.

Senator FRELINGHUYSEN. Are you at liberty to sell this control?

Mr. MINGLE. Absolutely.

Senator FRELINGHUYSEN. To other interests?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. There is nothing in the agreement to prevent that?

Mr. MINGLE. No, sir. I could sell the entire stock within an hour.

The CHAIRMAN. Are you making machines for the Japanese people?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. What is the extent of the contract?

Mr. MINGLE. Let me amend that. We are making machines for the Japanese Government subject to the release of the War Board. The Aircraft Board have given consent to the building of 10 machines known as the J. R.-1-B. type of plane.

The CHAIRMAN. In other words, you are doing some work for the Japanese Government because, and only because, the Government of the United States has consented to it.

Mr. MINGLE. Absolutely. Those machines in no way can be released until the War Board consents.

The CHAIRMAN. You are doing no work for the Japanese Government, or anybody else, except as the United States Government knows of and consents to.

Mr. MINGLE. Absolutely; that is the only way.

The CHAIRMAN. Now, Mr. Mingle, we have been furnished with a list of the contracts and agreements with the Aircraft Production Section of the aviation organization in Washington. I will read them off and ask you if these are in accord with your recollection.

Senator FRELINGHUYSEN. Is Mitsui & Co. a corporation?

Mr. MINGLE. It is a Japanese corporation organized under what we commonly know as the limited corporation law.

Senator FRELINGHUYSEN. Under an American charter?

Mr. FINKELSTEIN. They are authorized to do business in New York.

Senator REED. Before we leave this stock question, let us put in a sample of the form of the preferred stock certificate, and also the common stock.

Senator FRELINGHUYSEN. They will void a certificate for the record.

Senator REED. The record will be sent to you for correction, and I will ask you at this time to put in a copy of each kind of stock. It may not be necessary to do it. I have read them both, and I find that the preferred stock does not have voting power, but has a right to be paid in full, both interest and principal, in preference. The other stock, the common stock, has voting power. That is not the exact language, of course, but that is my construction of it.

The CHAIRMAN. You can put one of those certificates of each kind of stock in the record.

The CHAIRMAN. Among the lists of contracts furnished by the Production Section of the Aircraft Organization in Washington, I find the following with your company:

Contract of October 4, 1917, 100 SJ-1, said to have been performed.

Contract of same date, October 4, 1917, 500 SJ-1, quantity delivered.

Contract of March 5, 1918, 150 SJ-1, quantity delivered.

Contract of March 28, 1918, 500 De Haviland 4's, no deliveries.

Contract of April 1, 1918, assembling of 50 sets of metal parts, no delivery.

Contract of March 6, 1918, 5 sets of spare parts of De Haviland 4's, no delivery.

Contract of January 7, 1918, 7½ sets of spare parts of SJ-1, 98 per cent quantity shipped.

Contract of March 13, 1918, 1½ sets of spare parts, SJ-1, 78 per cent delivered.

Contract for 3 sets of spare parts, SJ-1, 100 per cent delivered.

Does that list of contracts tally with your records?

Mr. MINGLE. I think that there are some omissions there.

The CHAIRMAN. What are they?

Mr. MINGLE. If my recollection serves me, there is an omission of the Handley-Page order.

The CHAIRMAN. I find here on the first of April, 1918, assembly of 50 sets of metal parts.

Mr. MINGLE. That should be the assembling of 50 complete Handley-Page machines. That means completely set up and ready for flight in this country and the assembly for foreign shipment of 450 planes knocked down.

Senator REED. Was that done?

Mr. MINGLE. That contract we now have.

Senator REED. When was it taken?

Mr. MINGLE. April 1. The first plane we will show you during the day.

Senator REED. If you have any other contracts than those named, you can give a list of them.

Mr. MINGLE. All right.

Senator REED. I have not got this corporation business straight in my mind. You started in with a bankrupt concern which was known as the Sloan Manufacturing Co.?

Mr. MINGLE. Yes, sir.

Senator REED. You went along with that, and then what was the next company?

Mr. MINGLE. The Standard Aero Corporation of New York.

Senator REED. That is the one that had a capital of \$500,000.

Mr. MINGLE. Yes, sir.

Senator REED. Did Mitsui & Co. finance that?

Mr. MINGLE. Yes, sir.

Senator REED. And then you organized subsequently——

Mr. MINGLE (interposing). The Standard Aircraft Corporation.

Senator REED. With a capital of \$5,000,000.

Mr. MINGLE. Yes, sir.

Senator REED. So that some of the contracts you have with the Government are in the name of the Aero Corporation and some of them are in the name of the Standard Aircraft Corporation.

Mr. MINGLE. Yes, sir.

Senator REED. But the stock of both of those companies is held in substantially the same way as the stock in the larger company.

Mr. MINGLE. Yes, sir.

Senator REED. Which I have already described?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. In addition to the contracts you have read off this list, you have a contract for the Handley-Page plane?

Mr. MINGLE. Yes, sir; we have a contract for the assembling of 50 complete Handley-Page planes in this country ready for flight.

The CHAIRMAN. Your contract for the assembling includes the manufacture of the parts, does it?

Mr. MINGLE. No, sir.

The CHAIRMAN. You simply receive the parts and put them together?

Mr. MINGLE. I would like to tell something about those things in my own way.

The CHAIRMAN. I want you to tell them in your own way.

Mr. MINGLE. If you will pardon me, I will tell the Handley-Page story in my own way so as to get it in the record.

About March 12 of this year we received a telegram from Dayton, Ohio, stating that—

The CHAIRMAN. From whom?

Mr. MINGLE. From Mr. M. W. Kellogg.

The CHAIRMAN. I wish you would state who he is.

Mr. MINGLE. Kellogg was at that time, and I believe is at this time, assistant to Mr. Potter. He was known until about two weeks ago as the director of production. I think he has been superseded by someone else. We received a telegram from Mr. Kellogg at Dayton, Ohio, asking if we could find some room to assemble the first Handley-Page machines. We wired back, asking how much of the machine was ready for assembly. Either by telephone or by telegram, we were advised that 60 per cent of the machine was ready for assembly, and we told him that we were ready to do anything that the Government thought we could do. We received word that the machines were being sent on here from Dayton, Ohio. Whether that machine was at the Dayton-Wright field or the McCook field I am not certain. Well, the boxes arrived here, and we were just about completing the garage. We unpacked the boxes in there, and discovered that instead of there being 80 per cent of the machine there was less than 10 per cent of the machine that could be used in any way.

The CHAIRMAN. That was about what date?

Mr. MINGLE. I think it was the 27th of March.

Senator REED. 1918?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. I think it would be well to state whether those were new parts or not.

Mr. MINGLE. I am going to ask Mr. Day to tell about those parts now, because he knows what is right. It has been my policy to leave those things to the technical men. I would like to have Mr. Day state how those parts came here.

Mr. DAY. The Handley-Page had been handled by the Signal Corps. It was the intention of the Signal Corps to have the parts made in various parts of the country at various and sundry plants. Parts of these had come from Dayton, McCook field, as Mr. Mingle has said. We were informed that 80 per cent was finished. When the machine arrived, I presume all the parts we had would fill a box the size of the table there [indicating]. The Handley-Page is now the largest aeroplane being manufactured. Very few were usable. We discovered after we got them here that a great many were merely samples that the manufacturers had made up to see that their dies were properly working. They were made up of low stress steel, which was not suitable for that job at all, and the same applied not only to the metal parts but the wood parts. There was a set of ribs that was a sample. It was of inferior material, and in no way suitable for use.

Senator New. Those parts were made at Dayton?

Mr. DAY. Part by the Fisher Body Co. and part by other concerns about the country.

Senator New. The Handley-Page people sent over here some expert men, some foremen from their factories in England. They were brought over here by Mr. Workman, I believe.

Mr. MINGLE. Yes.

Senator New. Were those parts made out there under the supervision of these experts?

Mr. DAY. I will have to explain that further. The original intention as to this Handley-Page machine was to build a model which was not to fly. They were going to build a machine up from the English drawings, adding thereto the changes necessary for the use of the Liberty motor. That machine was not to fly; it was not designed to fly. They were to go ahead to produce machines which would be shipped abroad and which were to fly. I immediately, if I may so express it, canned the idea.

Senator REED. What do you mean by "canned"?

Mr. DAY. I would have nothing to do with a machine that was not to fly. To my mind, it was an absolute waste of time. We had the English drawings.

Senator New. You wanted a demonstration as to whether the machine was worth anything.

Mr. DAY. The only changes we were making were such changes as were necessary to incorporate the Liberty motor.

Senator REED. They sent drawings of the Handley-Page machine and they sent you some of the parts of the Handley-Page machine. They were to furnish all the parts and out of those parts and drawings you were to construct a modified machine which would handle the Liberty motor?

Mr. DAY. Yes, sir.

Senator REED. But other changes were to be made in it in addition to those looking to the handling of the Liberty motor?

Mr. DAY. Only such changes as involved a difference in material as used in England, and small items of design which were necessary because of changes in material.

Senator REED. The main change, however, was such a modification in the fuselage, and in the wings and the other parts and make-up of the machine as would make it capable of being flown successfully with the Liberty motor.

Mr. DAY. Yes, sir.

Senator REED. And you were requested to make up a sample machine and make the modifications in this sample machine and adapt it to the use of the Liberty motor theoretically, but without an opportunity to try it out practically; that was the request?

Mr. DAY. No. I may have given you the wrong idea. That was the original idea when the Signal Corps had this Handley-Page machine. When it came to us, before we took the Handley-Page, we made our own plans and said that if we took it——

Senator REED (interposing). I am asking what they asked you to do.

Mr. DAY. That is what I mean.

Senator REED. Now, let us get this straight. You made the statement that they asked you to do certain things and that you declined to do them.

Mr. DAY. That is correct.

Senator REED. You said you "canned the idea." Now, I am trying to get this down to the point where you canned it. What was it that you canned? You followed that a certain distance. Am I right in saying that what they wanted you to do was to take the drawings and the parts that had been furnished you and construct a machine here, and to modify that machine so that it would carry the Liberty motor, and then you were to have no opportunity to test the Liberty motor in that machine?

Mr. DAY. Yes, sir.

Senator REED. Having made that machine in that way, without test, you were to go on manufacturing 50 machines for use in this country and 450 machines to be sent to Europe? That was the idea?

Mr. DAY. Yes, sir.

Senator REED. Without test?

Mr. DAY. Yes, sir.

Senator REED. And you declined to proceed at all unless they would change that scheme and arrange it so that you could get an actual test of the machine before you made quantity production?

Mr. DAY. That is correct.

Senator REED. Who was it that asked you to do that thing?

Senator FRELINGHUYSEN. May I interrupt for a moment?

Senator REED. Yes.

Senator FRELINGHUYSEN. Was not the danger there in the fact that those parts were simply models and could not be effective machines unless you had the tensile strength test and the stress test, in order to make the machine an effective working machine?

Mr. DAY. To a large extent; yes, sir.

Senator REED. You had to rely upon theory?

Mr. DAY. Yes, sir.

Senator REED. Who asked you to proceed in the way you have described?

Mr. MINGLE. I can state that for the reason that as soon as we got that in our minds, that that is what they were driving at, we said, "We will not deal with that."

Senator REED. Who had you been dealing with?

Mr. MINGLE. There were so many different people from the Signal Corps that I do not know. It was a general conference.

Senator NEW. But it came from the Signal Corps?

Mr. MINGLE. No, sir.

Mr. DAY. That was the way the Signal Corps started the job and that is the way it came to us, in that original form.

Mr. MINGLE. As soon as we discovered that we stopped.

Senator REED. Who was it you contracted with? Who was the man you talked to about taking this job?

Mr. MINGLE. One man we had a conference with was Mr. Kellogg.

Senator REED. Have you got any telegrams from him?

Mr. MINGLE. Yes, sir. Let me explain that what has been outlined here was the scheme of the Signal Corps that was adopted last fall, in 1917, as the method they were going to pursue. These draw-

ings, I am informed, arrived in this country some time during the summer of 1917. The Signal Corps then mapped out the scheme which I have stated, and started to do the thing in Dayton. Mr. Kellogg was a new man on the job, and when he got to Dayton he sent this telegram to us, asking us to take over the work until they reached here, and until the English engineers reached here. We did not know that that was the scheme that they had adopted. I should say that we got our information direct from the English engineer.

The CHAIRMAN. What is his name?

Mr. MINGLE. Chamberlain. He was the engineer of the Handley-Paige Co.

Senator REED. What did he have to say about this scheme?

Mr. MINGLE. I would not say what he thought, because——

Senator REED. What did he say about that?

Mr. MINGLE. He told us that was the intention. The minute we found that out we said no.

Senator REED. Your engineer, Mr. Day, said that was not the proper way to proceed.

Mr. DAY. No, it was not. It would have been a waste of valuable time.

Senator FRELINGHUYSEN. Was not the reason for adopting that plan their desire to give the manufacturers of spare parts an opportunity to get to work?

Mr. MINGLE. When we discovered the condition that has been outlined, we immediately said that we would have nothing to do with the job unless we were given absolutely unqualified and complete control as to the production and as to engineering.

Senator REED. That is, a complete right to test the machine?

Mr. MINGLE. To build the machine as we wanted to build it, both from a production standpoint and an engineering standpoint.

Senator REED. You wanted to test the machine?

Mr. MINGLE. Yes, sir. The reason for that is that my confidence and the confidence of the people who backed me financially is so supreme in Mr. Day; and the engineering division now in Washington, or the powers that be in Washington, are of the same opinion. Since the development has taken place that we insisted upon; so that I felt that was absolutely the only way that this concern could do anything with the Handley-Paige and ever get it into production. It had been handled all over the country. I think there were 30 different concerns, if my memory serves me correctly, to whom these parts had been farmed out before they decided whether a certain part could go into the machine, or whether they could make one kind of material or another kind. Of course, I may be getting a little bit excited. I am an American citizen first of all, and the thing has gotten on my nerves so that it affects my mental condition once in a while. After this contract was given to us by the engineering authority on the job——

Senator REED. What do you mean by "authority?"

Mr. MINGLE. The first 10 planes of the 500 we could produce in any way.

The CHAIRMAN. When?

Mr. MINGLE. April, 1918. We could produce them in any way that we saw fit. The first thing was to get one machine in the air, the

next thing to do was to get one that we could stand test, the next thing was to have the machines come through so like the first one that any modifications that developed in the flight of the first machine we could quickly make in the second and third machine, and so on, until we had as perfect a machine as could be built. All through, however, as soon as we determined that a metal part was satisfactory, we could give an order authorizing for complete production that particular part.

Senator REED. Authorizing some person or persons to make enough of that particular part in the way you had demonstrated, so that you would have enough to complete the full order of machines as far as that part was concerned?

Mr. MINGLE. Yes, sir.

Senator REED. Let me get this a little bit clearer. As I understand you—and if I do not state this correctly I want you to correct me—the proposition that was made was this: That the Government arranged for a large number of concerns to make different parts of the Handley-Page machine, and it was proposed that those different parts made by those different concerns would be sent here to you people, and that you were to assemble a sample machine which you were not to fly. Having assembled that sample machine, which you had never flown or tested, you were then to proceed to assemble 50 machines for the use of our own Government and 450 for the use of the British Government. You refused to enter upon that program because you did not regard it as safe?

Mr. MINGLE. And sane.

Senator REED. Or sane?

Mr. MINGLE. Yes.

Senator REED. You insisted that you would not take the parts that were sent to you and accept them out of hand, but that you would reserve the right to do two things: First, to accept the parts that were sent to you by the Government, or to get parts wherever you pleased, to get them in your own way; and second, to test out these various parts and determine whether or not they were suitable to go into a completed plane. Now, you have added a third condition to that, which is that you proposed to set a plane up and actually fly it to determine whether it would fly and whether it needed certain changes. I will add a fourth condition, which is to make those changes which you found to be necessary in order to make it a safe and efficient plane; that is the story?

Mr. MINGLE. That is the story.

Senator REED. And until the Government conceded what you demanded, you refused to touch the job?

Mr. MINGLE. Yes, sir.

Senator REED. If you had proceeded in that way, what would have been the objection?

Mr. DAY. I can make that plain. This was entirely in the control of the production and engineering department.

Senator FRELINGHUYSEN. Was it under Col. Deeds?

Mr. DAY. I think that department is under Maj. Gray. It was governed, I think, by the specification division, which is also under Maj. Gray. I quickly discovered, in investigating this machine, that there were a great many mistakes in the specifications. I discovered

engineering changes had been made which were, in my estimation, not in any way advisable. I found there was a necessity for changes which I considered advisable that had not been made. I told Mr. Mingle that we should not consider taking over this job unless we had the entire engineering authority and could avoid the delay that would be necessitated by writing to Washington for permission to make engineering changes when we saw fit to do so. Also I asked that I be allowed to pass on the specifications and change the Signal Corps specifications wherever I saw fit to do so.

Senator REED. Were those rights granted to you?

Mr. DAY. Yes, sir.

Senator REED. You said that you were ready to take this attitude from previous experience. What was your previous experience?

Mr. MINGLE. The Caproni machine was sent on the 25th day of January, giving us absolute and full control as to that proposition, and we believe in March and April from the work developed on that machine that we were absolutely justified in taking the stand that we insisted upon taking relative to the Handley-Page. Our experience with regard to the Caproni machine was that with that same freedom we had developed a good machine.

Senator REED. Did you have any previous experience that led you to believe that the drawings and blue prints sent by the Government were inaccurate?

Mr. MINGLE. That reaches into infinity.

Senator REED. That does not get anywhere here. Did you have that kind of experience?

Mr. MINGLE. Oh, yes, sir. It was continual.

Senator REED. From the first?

Mr. MINGLE. Yes, sir.

Senator REED. So that when you say your previous experience led you to conclude you ought to make this condition that you should be given a free hand, you mean to say that prior to this time you had found that the drawings that had been given you, as well as the specifications, by the Government, had been inaccurate, that they had to be revised, and that they could not be followed?

Mr. MINGLE. Yes, sir; I will say that.

Senator REED. And that that had been habitual and constant from the first?

Mr. MINGLE. Yes.

Senator REED. One thing further. As I understand you, it is not only true as to this Handley-Page machine that you found the drawings inaccurate, but I want to ask you if up to this time when you were asked to assemble the Handley-Page machine and go on making it without flying tests, the Liberty motor had ever been tested in that machine?

Mr. MINGLE. It had not been.

Senator REED. I want to know that I am right about this. I want to know if the United States officers proposed to have you make a machine from parts that had been assembled from drawings which were sent to you, the machine when completed to be equipped with a Liberty motor, and yet that kind of machine had never been tested with a Liberty motor in it?

Mr. MINGLE. Yes.

Senator REED. And you were to make these machines in quantity for the British Government?

Mr. DAY. In the first place, this particular type of machine——

Senator REED. I wish you would answer the question yes or no.

Senator NEW. Answer the question yes or no and make your explanation afterwards.

Mr. DAY. I have forgotten just what the question was.

Senator REED. Please read the question.

(The question was read as above recorded.)

Mr. DAY. I will say that they did.

Mr. MINGLE. I want to supplement that by this statement, that so far as Mr. Kellogg and Mr. Potter are concerned, at the time this Handley-Page came here I have no reason for stating that they knew that this was a sample, dummy, or model machine. The idea has been created and carried through to the point when it was sent to us by officers of the Signal Corps, and the men who brought it here were simply coming into an old condition with which, in my opinion, they were not acquainted. I do not think Mr. Potter and Mr. Kellogg ever heard of such a thing.

Mr. DAY. They did not know.

Mr. MINGLE. After this thing was done I made a trip through the Handley-Page plants to which these parts had been assigned, and the condition which I found in those plants was the greatest indictment against the Signal Corps that I ever saw in my life.

Senator FRELINGHUYSEN. I would like to ask Mr. Mingle what plants those were that he went through?

Mr. MINGLE. Now, there is a map which I had made up when I got back showing the distribution of the parts.

The CHAIRMAN. Can we get a copy of that?

Mr. MINGLE. Yes, sir.

Senator NEW. I would like to ask a question.

Senator FRELINGHUYSEN. Let me develop this. You spoke of an indictment of the policy of providing these parts in this manner. What do you mean by "indictment"?

Mr. MINGLE. The misconception of conditions and the absolute lack of any one person acquainting himself with the whole proposition of Handley-Page production as a Handley-Page plane. There was not anyone who had the least conception, so far as I could find out, of what the entire program was. It was a case of Bill was doing this and Jack was doing that.

Senator NEW. Now, I would like to ask this question. It has been testified to before our committee by Mr. Workman, who was the American representative of the Handley-Page people, that he brought to this country, or, rather, that the Handley-Page people sent, in July, of 1917, a complete set of Handley-Page drawings which were consigned to him in New York; that those drawings were taken possession of by the Signal Corps without his knowledge and without the knowledge of the Handley-Page people; that they were for some time retained by the Signal Corps people and afterwards recovered by him from them at which time he claimed possession of them and got them back.

Now, if the Handley-Page program had at that time been carried out and they had been permitted to make with you or with anybody

else their direct arrangement for the production of Handley-Page machines without the intervention of the Signal Corps, what saving would it have meant to you in time in the production of those machines?

Mr. MINGLE. From July, 1917, at least five months; that is, we would have been producing planes from July 1 to date.

Senator REED. In quantity?

Mr. MINGLE. In quantity.

Mr. DAY. I would say that we would save from five to six months.

Senator NEW. Do you know anything about what changes were made by the Signal Corps in those Handley-Page plans, the plans that were sent by the Handley-Page people to the American representatives?

Mr. DAY. I would like to say this much: The drawings which I have seen, and which I presume are the drawings in question, were not complete; that is, the engine nacelles and the installation were not complete, and a great deal of the detail with regard to gasoline tanks and motor installation was still incomplete when the drawings came to us.

Senator REED. Assuming that in July, 1917, you had been furnished with a complete set of plans and specifications and detailed drawings of the Handley-Page machine, and that you had been required then only to modify those drawings to the extent that would be necessary in order to install a 12-cylinder Liberty motor, how much time would you have saved?

Mr. DAY. From 5 to 6 months.

Senator REED. You have made a statement about some of the plans not being complete. You never saw the particular plans?

Mr. DAY. No; I said the plans we had.

Senator REED. You are not speaking of his plans?

Mr. DAY. No. When word came to us we started all over again. I started again on the design of such parts as involved the motor, and items which we thought necessary.

The CHAIRMAN. Let us take up another phase of the question. Have you uncompleted contracts, with the exception of the Handley-Page contracts?

Mr. MINGLE. Yes, sir. We have De Haviland.

The CHAIRMAN. What others besides those two?

Mr. MINGLE. The Aero Corporation was given an order for a type of plane which we developed ourselves, known as the "M defense" machine, which has since been adopted as an advanced training machine.

The CHAIRMAN. Is that the plane of which we heard this morning, and of which you expect to produce about 4.50?

Mr. MINGLE. Yes, sir. That is the plane.

The CHAIRMAN. We heard about that at the other plant. How many De Havilands have you produced to date?

Mr. MINGLE. One.

The CHAIRMAN. When was that?

Mr. MINGLE. That was finished April 7.

The CHAIRMAN. When do you expect quantity production?

Mr. MINGLE. That I can not answer.

The CHAIRMAN. Why?

Mr. MINGLE. There is not a man that can tell until somebody puts his foot down and says, "produce it as it stands to-day and get it out."

The CHAIRMAN. They are producing the De Haviland plane at Dayton, Ohio, in a moderate quantity? Are you not operating, or supposed to be operating, in your production on the same character of plane they use there?

Mr. MINGLE. We are supposed to. This is one of the things that the automobile people have never seen. Daily there are changes in the location of very small parts which have nothing to do with the function of the machine, but which are made from a production standpoint, in order to increase production. Those changes are installed in the Dayton-Wright machine, the drawings are sent to the Signal Corps, and the Signal Corps transmits them, as a rule, to the New York office of the Signal Corps, and by them they are transmitted to us. Sometimes we are as much as two weeks or more in getting these new drawings, and in the meantime some fellow comes here from the Signal Corps and says, "This thing is not right. That is not the way they are doing it at Dayton." We have to stop and wait until we find out what is the way they are doing it at Dayton, or whether we shall proceed.

Last week, for instance. I went to the fuselage plant and the superintendent said, "We have stopped all work on the fuselage. Fifty-one changes have come in this week and the 18 jigs which we have made have got to be changed."

The CHAIRMAN. Changes are made at Dayton by the Dayton-Wright Co. or by the engineering department?

Mr. MINGLE. That I can not tell.

Mr. DAY. They are made by the Dayton-Wright Co., sanctioned by the Signal Corps. It is the Signal Corps' work, really.

The CHAIRMAN. It is done by the Dayton-Wright Co.?

Mr. DAY. That is right.

The CHAIRMAN. Then the plans, instead of coming direct to you, go to Washington?

Mr. DAY. After they leave the Dayton-Wright Co. they go to the New York office.

The CHAIRMAN. Is that a branch of the Signal Corps?

Mr. DAY. It has charge of this district, as they call it.

The CHAIRMAN. After reaching the New York office, if they are approved, they go to Washington?

Mr. DAY. No; they come here. The New York office does not pass on them at all.

The CHAIRMAN. Why are they not sent to you direct?

Mr. DAY. Because they think we should be supervised. It is a matter of procedure.

The CHAIRMAN. In other words, it is a matter of red tape?

Mr. MASTERS. We have had drawings sent to us by the Signal Corps, these Van Dyke copies, and in the same mail the Dayton-Wright people have sent blue prints from the Dayton-Wright plant. These blue prints will show four or five changes which are of a later date than those we have had from the Signal Corps.

The CHAIRMAN. For the sake of the record, state what you mean by "Van Dyke copies".

Mr. MASTERS. That is taken from the original film, so that we can print blue prints from it.

The CHAIRMAN. So that you can duplicate from it?

Mr. MASTERS. Yes.

The CHAIRMAN. To what extent has the production of De Haviland planes been retarded or prevented by these numerous changes since the contract was made?

Mr. DAY. It has been entirely prevented up to the present time.

The CHAIRMAN. Entirely prevented?

Mr. DAY. Yes, sir.

The CHAIRMAN. Can you produce De Haviland planes under your contract unless this condition is changed?

Mr. DAY. We can not.

Senator REED. How many changes have you had in the De Haviland; about how many?

Mr. MASTERS. I could not tell you that. We have not a complete set of drawings up to the present time, but we did have at one stage of the game 1,140 drawings. That was back in March; and on those 1,140 drawings we had 840 changes.

Senator REED. Were those changes of a material or merely a nominal character?

Mr. MASTERS. Both.

Senator REED. Which predominated?

Mr. MASTERS. Well, I do not know which predominated. There was enough so that there was uncertainty in our minds.

Mr. DAY. In many cases when there was a change they recalled the drawing. Of course that took it entirely out of our hands.

Senator REED. Have you a sample of the modern De Haviland plane here?

Mr. MASTERS. Yes, sir.

Senator REED. Why can't you go ahead on that?

Mr. DAY. We can in the course of time, but it is necessary as a production matter to have drawings from which the shop men can work. It is necessary to have some drawings to manufacture these parts.

Senator REED. What is there to prevent you from making your own drawings from the standard machine in your possession?

Mr. MASTERS. Because the Signal Corps say that those drawings are not correct.

Senator REED. Where was this plane made?

Mr. MASTERS. Dayton, Ohio.

Senator REED. How long have you had it?

Mr. MASTERS. Two or three weeks.

Senator FRELINGHUYSEN. In other words, the Signal Corps prevents you from going ahead?

The CHAIRMAN. You have a plane sent here by the Signal Corps. made by the Dayton-Wright factory, but you are not permitted to go ahead, because the Signal Corps says the sample is not correct.

Mr. MASTERS. That is correct.

The CHAIRMAN. Have you any idea when you will begin to produce in quantity?

Mr. MASTERS. When we get full information from the Signal Corps.

Mr. MINGLE. I do not think we have anything definite on that.

The CHAIRMAN. When, if at all, did you make application to the authorities at Washington for leave to go ahead with the production of your De Haviland?

Mr. PENNEVILLE. As near as I can recollect, it was early in April.

The CHAIRMAN. Did you receive any reply?

Mr. PENNEVILLE. We received no official "Go ahead." Our purpose was to get permission to manufacture all our planes along the line of this one, provided the official try-out was satisfactory. I do not think we have ever received official sanction of the machine.

Mr. MINGLE. This is what we did. I went to Washington and I requested that an inspection be made of our plane and that a release be given on that plane so that we could construct the remainder or the balance of our order from that plane where it did not affect the interchangeability of spare parts, and where it did not affect the strength of the machine or the installation of the military devices which are put upon it.

The CHAIRMAN. When was that?

Mr. MINGLE. That was somewhere about the 17th of April. They sent a representative here who made a report, but from that day to this we have never been given official sanction to go ahead and build the plane as we have built it.

The CHAIRMAN. Or to build any other plane?

Mr. MINGLE. Or to build any other plane?

Mr. MASTERS. Capt. Rose is at Mineola. He went over that plane on May 3.

The CHAIRMAN. Where is that plane which you made?

Mr. MINGLE. It is now at Mineola.

The CHAIRMAN. Where was the plane which you made tested?

Mr. MINGLE. At Mineola.

The CHAIRMAN. By Government officials?

Mr. MINGLE. I am not certain whether Government men have flown it or not.

The CHAIRMAN. Have you asked the Government to test it?

Mr. MINGLE. Oh, yes, sir.

The CHAIRMAN. Have you asked the authorities in Washington to test it?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. When?

Mr. MINGLE. In April, about the 17th of April.

The CHAIRMAN. And you received no response?

Mr. MINGLE. I assume they have taken the flights made by our own fliers.

The CHAIRMAN. They have never told you to go ahead and manufacture?

Mr. MINGLE. They have never questioned the performance of that machine.

The CHAIRMAN. What is your capacity for quantity production of that machine as soon as you get an order?

Mr. MINGLE. Including the spare parts, our capacity should be 20 a day.

The CHAIRMAN. How much of a force have you here; what is your numerical working strength?

Mr. MINGLE. At the moment our working force is approximately 3,300 in this plant.

The CHAIRMAN. What proportion of this force is not worked because of inability to go ahead with the machines?

Mr. MINGLE. At the moment I would not say any of the force was out of work for the reason that we are building the H. S.—1 boat for the Navy. We are going ahead on the parts which we know, or feel reasonably certain, are not going to be changed. Therefore we are keeping our force employed.

The CHAIRMAN. If your force is now employed to capacity and you should get an order to go ahead, you would have to increase your force?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. Is that an easy thing to do?

Mr. MINGLE. Up to the present time we have found no difficulty in doing it.

The CHAIRMAN. Can you get skilled labor?

Mr. MINGLE. Up to the present time we have had no labor troubles.

The CHAIRMAN. So that you do not apprehend any difficulty in getting an added force of employees?

Mr. MINGLE. That is our belief.

The CHAIRMAN. Have you any contracts with the Government for the manufacture of that machine, or any parts of it, or merely for the assembling?

Mr. MINGLE. We have a contract with the Government which, in brief, is this: All the parts for the 500 machines which the Signal Corps have ordered are to be supplied to us through Signal Corps channels. All spares in connection with that order of 500, the parts of which are being made by Signal Corps contractors, are to be furnished by those contractors through the Signal Corps; and all parts that we have created in this plant are to be supply by us.

The CHAIRMAN. What do you means by "created"?

Mr. MINGLE. Such as nacelles.

The CHAIRMAN. Do you mean constructed?

Mr. MINGLE. That we have developed. Perhaps that is a better word. The contracts for those are to be let for us on all 500 machines.

Mr. DAY. Except the radiators, propellers, gasoline tanks, which are to be supplied by the signal Corps from our drawings and under our specifications.

The CHAIRMAN. Does the contract provide when the assembly shall take place and when the contract is to be completed?

Mr. MINGLE. Not when it is to be completed, but all the Signal Corps contracts on the Handley-Page have delivery dates specifically stated in them.

The CHAIRMAN. When is your first delivery contemplated?

Mr. MINGLE. The first Handley-Page we expect will be flying some time next week.

The CHAIRMAN. And the parts for that are assembled here?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. So that you expect to have assembled and ready for flying a complete machine next week?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. How fast after that do you contemplate you will be ready to assemble and deliver that type of machine?

Mr. MINGLE. There is some controversy between the Signal Corps and ourselves on that point. We hold that the orders for the parts should not be allowed to go through in their entirety to completion until this machine has been flown, and we are satisfied that those parts are the correct parts to go into that machine.

The CHAIRMAN. In other words, you want the first machine to be thoroughly tested before duplicating it?

Mr. MINGLE. Yes, sir. The Signal Corps, or some members of it, state that they have spent money enough already on the proposition, and why not take a chance that these other parts are all right.

The CHAIRMAN. Who are the spokesmen of the Aviation Service upon that proposition?

Mr. MINGLE. The representative of that service of the Signal Corps in Capt. MacKenzie.

The CHAIRMAN. Is he the Government official who proposes, instead of flying the plane, as you have suggested, to take chances upon these parts which must enter into the completion of the assembled machine which is to be used at the front?

Mr. MINGLE. That is my understanding.

Mr. DAY. Yes. Capt. MacKenzie has urged me personally and continually to release the parts, which I refused to do. It is within my authority entirely to refuse to release these parts.

The CHAIRMAN. You get your authority from the company?

Mr. DAY. I got my authority from a letter from Mr. Kellogg's office. I said that the control of the engineering situation was in my hands.

The CHAIRMAN. Are those parts inspected here separately by Government officials or your representatives, or both?

Mr. DAY. The parts which are sent in by the subcontractors are inspected by the Signal Corps at the plants where they are manufactured, but due to the fact that we felt the inspection was not sufficient or satisfactory, we have refused to allow the shipment of any parts until they have been passed upon by myself.

Senator REED. Let me see if this is the situation. Your company does not want to take the responsibility of assembling and delivering Handley-Paige machines under its contract upon the test of a sample machine in the field, but you insist upon a careful test of all the component parts of each machine, while the Government takes the position that the test made of the sample machine should be sufficient for the assembly of the other machines without further tests?

Mr. DAY. That is quite correct.

Mr. MINGLE. The Government takes the position, or Capt. MacKenzie's representative here takes the position, that we should go ahead on all the parts which are now in the machine before the machine is tested in the air, whether the parts have been made by our own company or by the contractors of the Signal Corps.

The CHAIRMAN. And you are not willing to do that?

Mr. MINGLE. Our position is that there should not be any "go ahead" given until we have tested first the machine in quantity. Now, we say that a certain number of parts should come through, so that if the parts are satisfactory, we can start immediately to assemble the additional machines and ship them abroad. If they are not right, all we lose are the parts for a few machines, instead of having the parts for 500 machines made up and rejected.

The CHAIRMAN. Has that been referred to Washington?

Mr. DAY. I will say that Capt. MacKenzie does not make any attempt to release the parts until they have my O. K.

The CHAIRMAN. But this difference arises here between officers of this company and Capt. MacKenzie?

Mr. DAY. Washington has sanctioned it.

The CHAIRMAN. Has it been referred to Washington?

Mr. DAY. No. It would be up to Capt. MacKenzie, the working head, to do as we see fit until somebody tells us not to do it.

The CHAIRMAN. This difference between the company and Capt. MacKenzie has not affected, so far, the operation of the company?

Mr. DAY. Oh, no.

The CHAIRMAN. So that you are going ahead on your own idea, as it were, notwithstanding this condition to which you have referred?

Mr. DAY. Yes, sir. I think it would be right to say that we are very well satisfied with the Handley-Paige condition in this plant in relation to the War Department.

Mr. MINGLE. Because they have given us a free hand up to date.

The CHAIRMAN. How far in advance of actual delivery should you have contracts in order to prevent a gap in production?

Mr. MINGLE. From three to four months.

The CHAIRMAN. Have you any contracts at the present time which will enable you to continue?

Mr. MINGLE. No, sir.

The CHAIRMAN. Have you been trying to get them?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. What sort of contracts have you been trying to get?

Mr. MINGLE. Our desire is to secure, first, a larger order for De Haviland fours.

The CHAIRMAN. How much larger?

Mr. MINGLE. We say at least a thousand machines. If they are going to make more than that, we should have a "go ahead" on as many orders as they can give us. They have placed orders, as we understand it, with some western companies for 4,000 planes.

The CHAIRMAN. What western companies?

Mr. MINGLE. The Dayton-Wright people.

The CHAIRMAN. Have you made a statement as to future machines?

Mr. MINGLE. If they do not wish to give us an order for further machines, we ask for an immediate determination as to what plane will be here when we finish the 500.

The CHAIRMAN. How long has it been since you drew the attention of the authorities to this condition?

Mr. MINGLE. That has been in existence for a month. We have made a statement that continuing orders were our only salvation.

The CHAIRMAN. Has it received consideration?

Mr. MINGLE. I had a letter from Mr. Kellogg to the effect that the matter would be settled in a few weeks. I wrote to him and told him that I felt in justice to everybody concerned it should be settled immediately.

The CHAIRMAN. Suppose matters remained in their present condition with regard to Government orders, how soon will it be before you are out of work? I have reference to Army orders.

Mr. MINGLE. On the De Haviland machine we would be out of work practically inside of four months.

The CHAIRMAN. How about the M defense machine?

Mr. MINGLE. In that same period.

The CHAIRMAN. So that as the matter now stands, your work for the Government will have been completed, independently of the Naval branch of it, within four months of the present time?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. If nothing unforeseen arises?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. What orders or contracts have you received which have been rescinded or abandoned by the Government?

Mr. MINGLE. Early last summer, when the Caproni was first talked of, we were told by Mr. Waldon, now Col. Waldon, and by Mr. Deeds, now Col. Deeds, and other members of the Aircraft program crowd in Washington, that we should hold this plant in Elizabeth for the building of Caproni planes, putting into operation as many hands as we could here on training plane machines and building up the organization for the building of the Caproni planes. Along in January of this year I was called to Washington, just at the time that Col. Deeds was transferred to Col. Squier's office. Col. Montgomery occupied his chair for several days. We were then given an order for 1,000 Capronis, 50 to be assembled and 950 to be sent overseas knocked down. We were told, and I was directed to come back on the first train and to take the necessary steps to get the drawings, etc., for buildings to handle that work, which would have been a large warehouse proposition. The assembling of the machines would have to be done in our present buildings, while the warehousing would have to be done in much larger buildings. Those drawings were prepared, and the next week I went to Washington and was told to hold up. No official order had ever been given.

The CHAIRMAN. For the machines?

Mr. MINGLE. For those Caproni machines, not what we call an official order, but an order which Maj. Shepler, Col. Montgomery, and others in Washington at that time absolutely believed would be put in official form as quickly as things could be brought around, which would have been in the course of from three to five weeks. It took about that long to get through an official order.

On the 25th of January, Capt. de Annunzio, engineer of the Caproni Co., with 12 of his men, came to this plant with a letter from Col. Deeds, stating that we should build the Caproni machine and put the same into production. The Italian prints were to be translated into English. We were to prepare American drawings and change the drawings, which were in metric terms, to English terms, and put the machine into production as quickly as possible. No changes were to be made in those drawings except those approved by Capt. Annunzio. We were given an absolutely free hand as to expense and production, and anything we wanted to do to prepare these drawings for production and get out the planes was to be done. That matter dragged along. No contract came through.

Along in February they began to sort of back and fill on the question of whether they were going to build Capronis or not, in quantity, and by March 1 it had been practically settled that they

would not build Capronis in this country at all, excepting the ones we were working on, or two or three for experimental purposes; and as a result of that we took this Handley-Paige proposition as a substitute. That ends that story.

The CHAIRMAN. You say "ends the story." Does that mean that it ends your connection with the Caproni production?

Mr. MINGLE. Up to that point. We put into production, or we prepared blue-prints and drawings and our bill of materials and the schedules, and completed, as we supposed, the first Caproni machine about May 1, with the exception of the installation of the engine, which was to be done at Mineola.

The CHAIRMAN. What engine?

Mr. MINGLE. The Liberty engine. The plane was shipped to Mineola. During the interval, from the time we got the Handley-Paige until the time the machine got down there, the time this first Caproni was sent to Mineola, there seemed to be a change of sentiment in Washington again, and they decided they would build some Capronis. They sent the Fisher body people here, and the Fisher body people, as I am informed, have been given an order to build Capronis.

The CHAIRMAN. Five hundred?

Mr. MINGLE. We have been directed, and have an order now for the building of 300 additional Capronis to be used as experimental and sample machines, and to complete the drawings and schedules and forward data necessary for the Fisher Body Co. to go into production on the Capronis, which we are now doing.

The Caproni machine, which is at Mineola, is just now about ready for flight. In another 10 days it should be in the air. It has been held up due to the fact that Capt. D'Annunzio has insisted that certain changes be made in the installation of the engine, etc.; that changes in the type of the engine, or the model of the engine, and the radiation and things of that kind, over which I had no control, should be made. We have given every assistance which we could possibly give, and, as I say, the plans will be ready, so we are informed, for flight certainly by the end of next week, unless something unforeseen occurs.

Now, our viewpoint on that Caproni situation is this: That we do not care what plane we build here; all we want to do is to do the best we can in getting out all the planes we can. If the Government in Washington considers that the Fisher Body Co. can do it more rapidly than we can, and considers it right to develop the paraphernalia with which they can do the work, we say that is all right, and we are willing to lend every effort to that end. But we have maintained that this company with the experience it has had in the development of the first machine is in a position to build that plane in a shorter space of time than it will take some new concern to get in a position to do it.

The CHAIRMAN. Have you requested authority to do it?

Mr. MINGLE. They said we had enough, and they said they could not reasonably give more.

The CHAIRMAN. Do you know that they have given the Curtiss plant more?

Mr. MINGLE. I do not know that.

The CHAIRMAN. You developed a sample plane under the supervision of the Italian representative of the Caproni machine?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. And that machine is about ready to be tested?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. In the meantime you have been ordered not to proceed, but a contract for production has been given to others?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. Now, regarding the De Haviland Nine. Were you ever given a contract for the production of De Haviland Nines?

Mr. MINGLE. We were given an order for spare parts for 1,500 De Havilands Nines to keep this plant going until we got into the production of the Caproni machine. That order was given on the 29th day of December, 1917.

The CHAIRMAN. Was it canceled?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. When?

Mr. MINGLE. That brings up this point. On January 10 they wired us that the prints for the De Haviland Nine were ready for production and that we should send our engineer to Dayton to get the prints.

Senator REED. From whom?

Mr. MINGLE. At the McCook field, the production engineering department. Mr. Day went to Dayton. I was in Washington. He took several men with him, and after two days' stay there he returned to this plant and reported to me that the prints were not ready for production. His story or statement to me was so contrary to the information which I had been given that I took Mr. Day to Washington and we laid the whole situation before the men in authority there.

The CHAIRMAN. Who were they?

Mr. MINGLE. I have forgotten now who that crowd was.

The CHAIRMAN. Is this a different crowd? You can put that in later.

Mr. DAY. That was Mr. Coffin, was it not?

Mr. MINGLE. We went and interviewed Mr. Coffin and the new men of the board, Mr. Hoyt, and Mr. Harris. Then we went to equipment division, and we told them the circumstances. The orders for the De Haviland Nine were very quickly canceled, and immediately we went into the production of De Haviland Fours.

Senator REED. What did you tell them?

Mr. MINGLE. That there was no De Haviland Nine print ready for production.

The CHAIRMAN. Thereupon they canceled this and all others?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. So it was then that you got a contract for De Haviland Fours?

Mr. MINGLE. No, sir; that was later.

The CHAIRMAN. Did they seem to be surprised at your story?

Mr. MINGLE. I think they were shocked.

Mr. DAY. We were given an order for 500 De Haviland Nines, complete machines.

The CHAIRMAN. That was at the time you told them that the plans were not complete?

Mr. DAY. About the same time.

Senator REED. When that order was canceled, you were given an order for the De Haviland Nine? You were talking about an order for De Haviland Nines.

Mr. DAY. Oh, that was for De Haviland Nine spare parts; that is the spare parts.

Senator REED. You went down to Dayton, Ohio, to see them about the plans for what kind of a machine?

Mr. DAY. De Haviland Nine spares.

Senator REED. That is the word that was omitted. You had a contract at that time for what?

Mr. DAY. For 1,500 sets of spare parts for the De Haviland Nines.

Senator REED. Then you came back here and you made a trip to Washington, and you told them at Washington that they were not ready to be put in production. Then they canceled your order for the spares and gave you an order for 500 De Haviland Nine complete machines?

The CHAIRMAN. And what else?

Mr. DAY. Then they changed that order.

The CHAIRMAN. At that time or subsequently?

Mr. DAY. Subsequently. I made another trip to Dayton and I found the De Haviland Nine was not ready for production.

The CHAIRMAN. Spares?

Mr. DAY. Complete machines. On the way out I talked with Maj. Shepler, who suggested that we build the first 100 De Haviland Fours. That machine was not ready for production, but was nearer ready for production than the De Haviland Nine. The order was changed to read 100 De Haviland Fours and 400 De Haviland Nines. It was found then that there were not going to be any De Haviland Nines, and then the order was changed to read 400 De Haviland Fours.

The CHAIRMAN. That is an uncompleted contract?

Mr. DAY. That is an uncompleted contract.

Mr. MINGLE. At the same time we were given an order for 1,500 De Haviland Nine spares we were given an order for 800 spares for the Bristol machine.

The CHAIRMAN. Was that canceled also?

Mr. MINGLE. That order was canceled.

The CHAIRMAN. When?

Mr. MINGLE. During January, some time.

The CHAIRMAN. Between the time you got these orders and their cancellation did you go to any expense in preparing for the carrying on of the contracts?

Mr. MINGLE. Yes, sir. We went to the expense of purchasing material which we were authorized to purchase along these lines. We were told to purchase the necessary material for the building of these different orders which, in our judgment, was applicable to these contracts. As a result of that we have purchased and, in our opinion, have in our yards and in our stock rooms more than a million dollars' worth of raw material which to-day is not applicable to any contract which we have, which we are now carrying, and which recently we have been authorized or given permission to sell in the open market

at the best price we can get if we so desire; and the question which is now in our minds is, Shall we dispose of the material, which, in our opinion, is so very hard to get when you want it?

The CHAIRMAN. Is it material which can be used in the manufacture of any sort of aircraft?

Mr. MINGLE. I do not believe there is 5 per cent of the material here that is not applicable to contracts which are now being worked on by different manufacturers throughout the country.

The CHAIRMAN. Why should you sell it?

Mr. MINGLE. I do not know.

The CHAIRMAN. Were you ordered to sell it?

Mr. MINGLE. We were told we could dispose of it, and the Government will not pay us for it until it is applicable to a direct contract.

The CHAIRMAN. Will the Government reimburse you for the difference between the cost of the material to you and the price you can get if you sell it?

Mr. FINKELSTEIN. In the form of a claim to be made afterwards.

Senator REED. What is this material?

Mr. FINKELSTEIN. Sheet metal tubing, aluminum, brass, copper, materials for making stuff for seats, leather for making seats, and lumber.

Senator REED. Why can't you use that material in the contracts which you now have?

Mr. MINGLE. Because the specifications for bills of material for the contracts we now have do not admit of the use of that material.

Senator REED. But other machines are being made by other manufacturers which are of such a character and such dimensions and specifications that this particular material would fit them?

Mr. MINGLE. Absolutely.

Senator REED. Under those conditions which you have described, you can sell in the open market and bring in a bill for the difference between what you get in the open market and what you paid?

Mr. MINGLE. Yes, sir.

Senator REED. Who told you to do that?

Mr. MINGLE. That was told us by the Finance Section, which includes as its main representatives in Washington Maj. Smith, Maj. Brown, Mr. Fletcher, and Mr. Potter. Those are the principal ones.

Senator REED. Did you explain to them that this material could be used by other manufacturers?

Mr. MINGLE. Absolutely. Only this morning, before you gentlemen arrived, I went to the office of the Signal Corps and I got the representative of the Approval Section in Washington. I told him that our inventories showed that we have \$1,700,000 worth of raw stock, at least half of which is not applicable to contracts which we now have. I said that that material, in my opinion, as an American citizen, should not be allowed to go out of the plant. I said that as an American citizen, and not as an aeroplane man or a manufacturer, because I do not consider that I am here as a manufacturer. Our organization is not a manufacturing concern during the period of the war. We are here as Government representatives, whether in uniform or not. We have sent out feelers. We sent them out several days ago and the inquiries and applications which we have had for that material indicate that there is a tremendous scarcity of it, and

we have been offered very much higher prices for some of the material than we paid for it. It seems to me that the Government should take over that material and either hold it here or distribute it to where it should be used.

Senator FRELINGHUYSEN. Were any of those offers made by competitors?

Mr. MINGLE. That I can not answer. There have been offers made for spruce and cherry which I would assume are from competitors.

Senator REED. When you made this statement to which you referred, in which you practically warned them that this stuff should not be thrown upon the open market, but should be taken either by the Government or by a concern contracting with the Government, what was said?

Mr. MINGLE. Their statement was that unless we had a contract by which the material was applicable they could not pay us for it. I said, "Buy the raw material." They said, "No, they could not do that." I said, "Make an inventory and inspect it." They said, "Well, you had better go out and sell it."

Senator REED. Whom did you have a talk with?

Mr. MINGLE. I have given the names of three men. I should say that that was a matter which was settled by Mr. Fletcher, Maj. Brown, and Maj. Smith.

Senator REED. When you went this morning to this plant and to this Government representative and made these references, to whom were you talking then?

Mr. MINGLE. Maj. Rose.

Senator REED. What did he say?

Mr. MINGLE. He said, "You are a business concern." He said, "You believe you have got \$800,000 worth of material that is applicable to a contract. That means a carrying charge for a year of \$80,000." That is the way he figured it. He said, "As a business concern, I would say sell it." Mr. Cook was there, and he said, "Mr. Mingle has a patriotic motive here, and in answer Maj. Rose said that it was a business proposition; that we were a business organization and that we could not afford to have the money tied up. That is my recollection of the conversation. That, to me, is absolutely outrageous.

Senator REED. Have you had any other trouble with sabotage besides that? [Laughter.]

Mr. MINGLE. That is the first time. My principals, these Japanese people, said, "Mr. Mingle, you buy the raw material and put it in your plants;" but I say it is not fair.

The CHAIRMAN. You may have answered the question that I am about to ask before. This material is going up in value all the time, is it not?

Mr. MINGLE. The great majority of it is.

The CHAIRMAN. Is there any loss whatever?

Mr. MINGLE. Practically speaking, no; but it ties up capital.

The CHAIRMAN. I understand that, but suppose you should act upon this governmental suggestion and go into the market and sell it, could you sell it at a profit?

Mr. MINGLE. I should say that we would make an average of 25 per cent on everything.

Mr. MASTERS. If they permitted us to do that, but we sold some tubing that cost us 3½ cents. We sold it at the market price of 6 cents, and the Government wanted us to refund on that.

Mr. MINGLE. There was no tubing of that kind to be had.

The CHAIRMAN. Wouldn't the customers for this material probably be contractors with the Government for airplanes?

Mr. MINGLE. Not necessarily.

The CHAIRMAN. Might they not be?

Mr. MINGLE. Yes, sir.

The CHAIRMAN. In other words, could your competitors use a great deal of this material?

Mr. MINGLE. In our opinion the major portion could be used by our competitors.

The CHAIRMAN. You have not sold it?

Mr. MINGLE. No, sir.

The CHAIRMAN. Is it fair to ask what you intend to do in the matter?

Mr. MINGLE. I intend to do this, sir. We will have our inventory concentrated upon my return from the West. In the meantime, as soon as that is concentrated, a statement of it will be sent to Washington, of just what that raw material covers. We will advise them so that we may have a correct record that we will sell that material at the market price to whoever wants it, but we are offering it to the Government first, but will not hold it indefinitely for them to determine whether or not they will take it.

The CHAIRMAN. You are offering it to the Government on what terms?

Mr. MINGLE. On the invoice price.

The CHAIRMAN. That is the cost price?

Mr. MINGLE. Yes, sir. We do not want to make one cent of profit out of the Government.

Senator FRELINGHUYSEN. You mean on this raw material?

Mr. MINGLE. Yes, sir.

Senator REED. Who was it you sold this material to? I am referring to this 6-cent tubing that was spoken of a moment ago.

Mr. MINGLE. The Breese Co.

Senator REED. What are they making?

Mr. MINGLE. Little aeroplanes. It is a sort of a toy training machine.

Senator FRELINGHUYSEN. Do you feel that you have been denied information at Washington from the authorities there that has been supplied to other competitors?

Mr. MINGLE. No, sir; I have no reason for thinking that.

Senator FRELINGHUYSEN. You feel that there is no influence in Washington against your company?

Mr. MINGLE. No, I would not say that. I do not know of any influence against our company, but I would say that until very recently our company has been an outsider.

Senator FRELINGHUYSEN. Did you say outsider?

Mr. MINGLE. Yes, sir.

Senator FRELINGHUYSEN. What do you mean by "outsider"?

Mr. MINGLE. There are four companies that are capable of large production.

Senator REED. What are they?

Mr. MINGLE. The Dayton-Wright Co., the Fisher Body Co., the Curtiss Co., and our own.

Senator REED. Why do you say that you have been outsiders?

Mr. MINGLE. For the reason that opportunities have been given those people to go into production on large orders; while we have been given 500 they have been given 2,000.

Senator FRELINGHUYSEN. They have been given the plans, designs, and models of machines desired for production before you were given those models and before you obtained that information?

Mr. MINGLE. Yes; that is true.

Senator FRELINGHUYSEN. In other words, you have been discriminated against in that regard, have you not?

Mr. MINGLE. I should say that is what you would say in cold language.

Senator FRELINGHUYSEN. Have you had any conferences with Mr. Ryan since his appointment?

Mr. MINGLE. I have not.

Senator FRELINGHUYSEN. Has Mr. Ryan been here?

Mr. MINGLE. No, sir.

Senator FRELINGHUYSEN. You have not come in contact with him in any way?

Mr. MINGLE. Only to meet him; that is all. I do not know whether he would remember me.

Senator FRELINGHUYSEN. Have you made any statement regarding these conditions at this plant?

Mr. MINGLE. No, sir.

Senator FRELINGHUYSEN. Have you met Col. Hall in that connection?

Mr. MINGLE. The engine man?

Senator FRELINGHUYSEN. Yes.

Mr. MINGLE. Mr. Day and he are old friends. Personally, I have not had anything to do with him. Mr. Potter, Mr. Kellogg, and Mr. Fletcher have been told everything practically that I have said here to-day.

Senator FRELINGHUYSEN. Mr. Ryan is the supreme head.

Mr. MINGLE. Yes, sir.

Senator REED. Let me interrupt for a moment. You say they have been told everything you have told us here to-day, but when they were told these things; were they told these things at the time the emergency arose?

Mr. MINGLE. As quickly as we could get to Washington. I spent most of my time until the last four weeks in Washington.

Senator FRELINGHUYSEN. You know that Mr. Ryan has been placed in charge of production with complete authority.

Mr. MINGLE. Yes, sir. I do not know how completely his authority is.

Senator FRELINGHUYSEN. It is stated in the newspapers that he is in charge of production. Why have you not taken these questions up with him and stated to him the conditions that exist?

Mr. MINGLE. My understanding was that he had his representatives who would acquaint him with the facts which I stated to them. I have never had any other idea than that the proper place for me to tell my story was to Mr. Kellogg, Mr. Potter, and Mr. Fletcher.

Senator FRELINGHUYSEN. Mr. Ryan has visited other plants and informed himself of the production of planes, but he has not visited this plant?

Mr. MINGLE. No, sir. I might say for your information also that Col. Deeds never visited this plant until two months ago.

Senator REED. I wish you would state fully the history of your efforts to get contracts and to get information upon which to carry out your contracts, and any interferences, if there has been any with you, in the carrying on of your work, as fully as you can, and state whether other institutions have been similarly treated, stating of your own knowledge if there have been any sinister influences or subtle influences or any evidences of perjury. State the facts, and we will draw our own conclusions. Now, I think if you want to tell this story, that gives you an opportunity to start in and tell it fully.

Mr. MINGLE. That opens a very broad situation, which I will try to state as clearly as possible.

Just prior to the outbreak of the war or, rather, the entry of the United States into the war, the manufacturers of aircraft, so far as they were known at that time, were called to a meeting in Washington by the Aeronautical Division of the Council of National Defense. At that meeting representatives of practically all the aircraft manufacturers were present. I should say from recollections that it was in February, 1917. I can give you the entire details of that meeting from a memorandum which I have and which I will furnish to you upon my return to this office. I do not think I can get it until my secretary comes back.

Senator REED. Please insert it at this point in your story.

Mr. MINGLE. I shall do so. The manufacturers at that time laid particular stress on the fact that what we needed were continuing orders. There seemed to be at that meeting and prior to that meeting many persons as civilians entering into the proposition, not aircraft manufacturers, but people who had been engaged in the automobile industry and who believed that aircraft could be built starting just at the point where the automobile industry was leaving off, and that the automobile people, because of their experience and organization, could better get quantity production than these aircraft manufacturers.

Senator REED. Who were these people? You say they were automobile people.

Mr. MINGLE. The principal representatives of the automobile interests at that conference were Mr. Coffin and Mr. Waldon.

Senator REED. Coffin was of what company?

Mr. MINGLE. He was then, or shortly before that had been, associated with the Hudson Co.

Senator REED. And Mr. Waldon was with what company?

Mr. MINGLE. With the Packard Co. From that time on there seemed to be an intention on the part of the manufacturers, or a desire, you might say, to monopolize aircraft production by getting it into the automobile industry, doing it largely through means of a cross-license agreement.

Senator REED. When did you first hear of the cross-license agreement, Mr. Mingle?

Mr. MINGLE. In January, 1917.

Senator REED. Proceed, now, with your story. These questions are only for the purpose of clarifying the situation as we go along.

Mr. MINGLE. This company, The Standard Co., had developed a training machine known as the J Type machine.

Senator REED. The standard J?

Mr. MINGLE. The standard J; yes, sir. This machine was tried out in January and February at Sea Breeze, Fla.. January and February, 1917, and the machine so tested out there had a favorable report made on it, and we completed delivery of those machines about January 1, 1917.

Senator REED. How many?

Mr. MINGLE. Eighteen of them.

Senator REED. To the United States Government?

Mr. MINGLE. To the United States Government.

We endeavored from the time that that machine was tried out to secure an order putting that machine into the primary training class. In May, 1917. Mr. Waldon made a trip to the Curtiss plant. Prior to that time an order had been given to the Fisher Body Co. and the Dayton-Wright Co. to get into production on the Curtiss JN-4 machine. I do not know what motor they were to use. Mr. Waldon had gone to Buffalo and there met Mr. Talbott, of the Dayton-Wright Co., and Mr. Kettering. At that time they were endeavoring to install the Hall-Scott motor in the Curtiss JN-4 plane, which had theretofore been equipped with a Curtiss engine.

Mr. Waldon phoned our Mr. Day and asked that the radiation prints and that the propellor and installation data relative to the machine be sent to him and sent to the Curtiss Co. I was in Washington at the time endeavoring to get recognition of our J machine as a primary training machine. The day following the request of Mr. Waldon for this data, Mr. Waldon and Mr. Kettering appeared at our Plainfield plant. Prior to their appearance Mr. Day had reported to me what had happened the day before, and when Mr. Waldon came into my office I told him that the greatest mistake that could possibly be made would be for them to fool with the installation of the Hall-Scott engine in the Curtiss machine; that we had a plane with the Hall-Scott engine ready for production.

Senator REED. Was that what you used in your standard J?

Mr. MINGLE. Yes, sir.

There was a very heated argument in my office. We then went out to the plant, into the drafting room, to show Mr. Waldon what we were doing, and he immediately grasped the situation, as did Mr. Kettering, that the Standard J, with the Hall-Scott equipment, was ready for production, and as a result of that meeting within five days he contracts with the Fisher Body Co. and the Dayton-Wright Co., were canceled as to the JN-4 with the Hall-Scott engine, and they were given orders in substitution for one thousand each of the Standard J-1 plane and we were given an order for one hundred.

Senator REED. Your own plane.

Mr. MINGLE. Our own plane.

Senator REED. In other words, you, in your plant, after a heated argument, convinced these gentlemen that the thing to do was to build the Standard J plane with the Hall-Scott engine in it because you had already produced it.

Mr. MINGLE. And had the print ready for production.

Senator REED. And had the print ready for production, and were also ready for quantity production.

Mr. MINGLE. Yes, sir.

Senator REED. How many could you have produced if you had been given. I will say, an order for 2,000? How soon could you have produced them, and what would have been your production? I mean beginning now, how soon could you give them some and how many, and so on; give us an idea. In other words, tell us what was the capacity at that time.

Mr. MINGLE. Our capacity at that time was, I should say, three per day.

Senator REED. What could you have made it in a short time?

Mr. MINGLE. We could have made it what we eventually made it, ten a day.

Senator REED. How long would it have taken to get up to ten a day?

Mr. MINGLE. Four months.

Senator REED. In the meantime you would have been producing four, five, six, seven, eight, and nine a day, working finally up to ten?

Mr. MINGLE. Yes, sir.

Senator REED. If you had been told at that time that they wanted 20 or 30, how long would it have taken to get to that point, if you had been given an order large enough to warrant putting in a new plant?

Mr. MINGLE. We would have had this up to 30 a day by January 1.

Senator REED. You told them the condition you were in and convinced them that instead of putting the Hall-Scott motor in the Curtiss plane, they should go on with the Standard J, which was your machine.

Mr. MINGLE. Yes, sir.

Senator REED. Your own invention.

Mr. MINGLE. Absolutely.

Senator REED. And they gave, not to the inventor or the company that had produced the machine the thousand order, but they gave an order for 1,000 machines within five days after this conversation you have referred to in your factory, to the Curtiss plant?

Mr. MINGLE. No, to the Fisher Body Co., and the Dayton-Wright Co.

Senator REED. A thousand to the Dayton-Wright Co., and they gave to your company an order for 100.

Mr. MINGLE. Yes, sir.

Senator REED. Did you try to get more than that?

Mr. MINGLE. We certainly did.

Senator REED. Do you know how soon these other concerns claimed to be ready to produce the 1,000 planes that they were to get?

Mr. MINGLE. The Dayton-Wright Co. contracted, as I recall it, to have the 1,000 machines out by January 1. Neither one was equipped at the time.

Senator REED. They did not have an equipped factory. Did they get them out?

Mr. MINGLE. No, sir; they did not get out one.

Senator REED. So, as a matter of fact, they did not get out those planes as fast as you could have gotten them out?

Mr. MINGLE. Absolutely right.

Senator REED. How about the Fisher Body Co.?

Mr. MINGLE. Their agreement, as I recall it, was that they should be in production on December 1 and to have all the planes out, as my recollection goes, by either February 1 or March 1.

Senator REED. What did they accomplish?

Mr. MINGLE. I do not think that the Fisher Body Co. got out their planes—I think they were all out by April 1. That is my recollection.

Senator REED. Did they produce them as quickly as you could have produced them.

Mr. MINGLE. No, sir.

Senator REED. Did the two companies both taken together produce as many planes as you could have produced in the same length of time?

Mr. MINGLE. No; and let me inject here that they cut down the order of the Fisher Body Co. and the Dayton-Wright Co. from 1,000 to 400 each.

Senator REED. It was those contracts of 400 which they got out?

Mr. MINGLE. Yes, sir.

Senator REED. Did you ask for more planes?

Mr. MINGLE. We did, sir.

Senator REED. Whom did you talk with?

Mr. MINGLE. Mr. Waldon, Mr. Coffin, Mr. Montgomery, and Mr. Deeds. I think those were the principal ones.

Senator REED. Did you talk to them at one time or at different times?

Mr. MINGLE. At different times and collectively many times.

Senator REED. In other words, if I understand you, you claim you were persistently "on the job," to use a trade expression, trying to get a large contract for your factory.

Mr. MINGLE. Absolutely.

Senator REED. Was this particular machine of the Standard J type?

Mr. MINGLE. Yes, sir.

Senator REED. And you talked to those gentlemen not once but a number of times.

Mr. MINGLE. Yes, sir.

Senator REED. What was Mr. Waldon's connection before he went into the aeroplane business?

Mr. MINGLE. Automobiles.

Senator REED. What company?

Mr. MINGLE. The Packard Co.

Senator REED. What was Mr. Coffin's connection?

Mr. MINGLE. The Hudson Co.

Senator REED. What was Mr. Deeds's connection?

Mr. MINGLE. The Dayton-Wright and the Delco Co.

Senator REED. What was Mr. Montgomery's connection?

Mr. MINGLE. He was a banker.

Senator REED. Where?

Mr. MINGLE. At Philadelphia.

Senator REED. He had some connection in Washington. What was that?

Mr. MINGLE. I should say that he was the finance or what you might call the credit man and advisor.

Senator REED. You named a Mr. Kettering.

Mr. MINGLE. He had nothing to do with Washington.

Senator REED. Was he one of the men you spoke to about this order?

Mr. MINGLE. No.

Senator REED. Now proceed with your story.

Mr. MINGLE. The order for 100 machines was changed to an order for 500 in June; no, it was not. As to those dates, I will have to correct myself, but we were eventually given an order for 500 machines on a fixed price basis.

Senator REED. What was that price?

Mr. MINGLE. My recollection is that it was \$6,400.

Along in September the question arose of going on a cost-plus basis, and the contracts were changed so that we produced 100 machines at a fixed price of \$5,300, and then we went on the balance of the order for 500 machines more on a cost-plus fixed profit basis. This order was started November 1. We delivered the 500 planes, as my recollection goes, before either the Dayton-Wright Co. or the Fisher Body Co. had delivered the completed machine.

In January we realized that we were running out of work because additional orders with releases had not come through. An additional order for 150 machines of the J-1 Type was given us, and this was completed in an entirety, including spare parts for 1,200 machines, on or before May 1.

Senator REED. That is a total of 1,200?

Mr. MINGLE. Spare parts for 1,200 machines. Our total production then of training machines of the J-1 Type was 750 complete machines and spare parts for 1,200 machines.

Senator REED. What was your working force at that time approximately?

Mr. MINGLE. Why, it developed from a force of 400 men in June to a crew of perhaps 3,000.

Senator REED. Did you ever ask these men why they gave your competitors large orders and cut you down to 100?

Mr. MINGLE. I would not say that I asked that directly, but I would say that the inference was that we were a small concern and that the fellows in the West could produce them in big quantities; therefore they could not give us any more than they did give us, figuring what we could produce.

Another important thing in the placing of the orders was that they thought we were in production, and in order to develop those plants out there they had to give them large orders to get them into production, or they would not go in it unless they had big orders.

Senator REED. As a matter of fact, when the order was taken in May, the Dayton-Wright plant did not exist?

Mr. MINGLE. The building itself existed. The building had been built but there was no machinery in it of any kind and no organization. There was no equipment. The Fisher Body Co. had no organization for aeroplane work.

Senator REED. But it had an organization for building bodies of automobiles.

Mr. MINGLE. Yes, for automobile bodies.

Senator REED. You had practically unlimited capabilities at that time?

Mr. MINGLE. Absolutely.

Senator REED. Did you make that known?

Mr. MINGLE. Yes, sir, they all knew. The Secretary of War was acquainted with the fact. On almost our first visit he was acquainted with the fact that we were financed by the Japanese interests.

Senator REED. Did they ever state as a reason for not giving these particular contracts that there was any objection on account of the way you were financed?

Mr. MINGLE. No, sir; never. While I can not point to any direct fact, the opinion of myself and the men closely associated with me was that they thought the aircraft industry should be developed and centered in the automobile territory in the middle west. There was an effort to accomplish that. There was no doubt about it in my mind.

Senator REED. Let us proceed with your story. What was the next thing that happened to you after the events you have already recited?

Mr. MINGLE. I stated that this morning, about the De Havilands, the Bristols, and the Capronies. There were continual promises made us of what we were going to get.

Senator REED. Could you very briefly now put in your answer to this question, so that it will all appear together, what was your next order?

Mr. MINGLE. The next order which was given us was for De Haviland spares and Bristol spares. It was given on the 29th day of December, after we had this plant here in operation for a period of some two months. I mean after we had the Elizabeth plant in operation for two months.

The Caproni order was given us in January. These three were canceled and then an order was given us for 500 De Haviland Fours, and that is the production machine upon which we are now working for the Signal Corps.

In January of this year we were given an order for a flying boat for the Navy, and we are producing those.

Senator REED. While you have been given these orders and have been interfered with in the manner heretofore recited, what about your rivals or competitors; what kind of orders have they had, to your knowledge?

Mr. MINGLE. None of the aircraft manufacturers, so far as I know, have been given orders for complete machines, except to tease them along, as it were, so that they would not raise a howl, except the Dayton-Wright and the Fisher Body Co. I do not think that the Curtiss Co. was given any orders anywhere commensurate, from what I have been told, with its ability to produce. Of course, everybody that has been to this plant has stated that we had an organization but not a plant. The plants were in the west; the organization for aircraft production was here. Therefore, they gave the orders to the west where they had the buildings, and we got the small stuff.

Senator REED. How much of a building did you have here? How quickly were you able to produce a building?

Mr. MINGLE. We had 300,000 square feet of floor space here on November 1 ready for production.

Senator REED. Did you say that if you could get large contracts you could produce larger buildings?

Mr. MINGLE. Absolutely. We went to it. We are the only manufacturers of aircraft outside of the Curtiss people, that enlarged their plant because of the war prior to January 1.

Senator REED. To what extent have you been held back with your present plant?

Mr. MINGLE. Sixty per cent. Through November and December our plant was absolutely idle, except for the small work which we gave it to break in a crew, anticipating orders which were promised but not given us, and upon which we were to start work not later than January.

Senator REED. At the present time you are making the Standard J?

Mr. MINGLE. We are making the De Haviland machines and the flying boats in this plant. We are doing some development work in our Aero Corporation and are preparing ourselves to build the M Defense machines. Let me refer for a moment to the M Defense machine, which may be of interest at this time. The M Defense machine was developed, an order given and a price agreed upon; that is, a verbal order was given to us, but no contract or order number has come through. To-day we are starting the production of the planes. No engines have been assigned to us by the Signal Corps, or instruments for those planes, which were to be furnished by the Signal Corps. No order number has been given us. Therefore, we are not able to get shipments on the railroads, because of the rules that only Government work is to be preferred, and we are trucking the materials for the building of these planes from our different plants to our assembling plants.

Senator REED. Let us go back for a moment. Where are you trucking from; how far do you have to truck?

Mr. MINGLE. From Gloucester City, Philadelphia, Newark, and New Brunswick to Plainfield.

Senator REED. Have you tried to get permission to ship by rail?

Mr. MINGLE. Yes, sir.

Senator REED. When did you try to do that, and from whom?

Mr. MINGLE. That I can not answer of my own knowledge because the information was given to me by one of our men first at the Plainfield plant.

Senator REED. I wish you would supply that information at this point in the record.

Mr. MINGLE. Yes, sir.

Senator REED. A moment ago you gave me an answer in which you stated various things without dates. You spoke a moment ago about the M Defense machine being considered, an order having been given to you, and then various delays occurring. When was it that they first began to talk about the M Defense machine. I want the dates.

Mr. MINGLE. The M Defense machine was developed and flown in April.

Senator REED. Of what year?

Mr. MINGLE. 1918.

Senator REED. This year?

Mr. MINGLE. 1918. It was flown in January, 1918, at Langley field. The machine was built as a defense machine to carry guns and as a

defense machine against bombers. It was designed for the 150 Gnome motor, and it was found that when the machine was completed there were no 150 Gnome motors to be built, and a 100-horsepower Gnome motor was put into the machine. It functioned so satisfactorily that after great urging we were able to secure a trial of this machine for defense training purposes.

This machine is similar in many respects to the machine being built for advanced training by the Thomas-Morse Co., of Ithaca, N. Y. After its test we were given an order to build 30 with the Gnome motor. As soon as the Gnome motor was installed and found to function properly, an additional order for 420 was given, making a total of 450.

Senator REED. When was this?

Mr. MINGLE. That was in April, 1918. We flew with the Le Rhone engine in May, 1918. Through Mr. Fletcher an order was given at this plant in May, 1918, at a fixed price, and the contract has not yet come through as above set forth.

Senator REED. So that you are uncertain, really, about being allowed to build that machine?

Mr. MINGLE. We are taking a chance.

Senator REED. You are getting ready?

Mr. MINGLE. We are getting ready because we believe what the man said who told us that the order would come through. If it does not we are stuck. We are at war, as I look at it, and that machine is a good machine. They have said they would take it. They have given us an order to build it.

Senator REED. What kind of an engine ought you to have in that machine?

Mr. MINGLE. The machine is properly engined now. It is an advanced training plane.

Senator REED. Was not that a fighter?

Mr. DAY. It was designed for a fighter, but it was afterwards decided it was not applicable for the purpose it was intended for. It was some one man's idea as to the need of a certain machine.

Senator REED. Do you know who that man was?

Mr. DAY. The original machine was built on order from the Government experimental department, which I believe was headed by Col. V. E. Clark.

Senator REED. That is the machine that was to be equipped with a motor, only three of which could be made in a day; three a day was the limit of the output?

Mr. DAY. Yes, sir.

Senator REED. And that was what motor?

Mr. DAY. The Gnome. It was originally designed for a 150-horsepower Gnome. Then it was decided to use the 100 Gnome or the 80 Le Rhone as an advanced training plane for training pilots for fighting machines.

Mr. MINGLE. I will state upon rumor, but not as an actual fact, that 1,000 Le Rhone engines were ordered from a concern in Pittsburgh, or thereabouts, and the fact that they were ordered had been forgotten. After our M Defense machine had been flown with the Gnome motor, these Le Rhone engines began to appear as a production proposition. They thought that the best way to make use of them was to put them into this M Defense machine. They had the

engines and had nothing to put them in and felt that this was the logical machine in which to use them, because we were ready for production of that machine.

Senator REED. Can you tell me what manufacturers you understand had the order for the engine?

Mr. MINGLE. The Union Switch & Signal Co., which I understand is controlled by the Westinghouse Co.

Upon the completion of the J-1 training machines, when the organization for the assembling of planes had been created and was operating to exceptional advantage, we endeavored to get business for that plant.

Senator REED. What plant?

Mr. MINGLE. The Plainfield plant, so as to hold our organization together, and as a last resort the M defense machine was to be placed in that plant and kept in production there until another type of English machine was adapted to be placed there. From May 1 until Thursday of last week the Plainfield plant has lost 50 per cent of its organization of a thousand men, but during that period we kept the remaining 500 hands engaged in general development work, more particularly on the JR-1-B, which we are building for the photographic division of the Signal Corps and for the Post Office Department, building in all 35 planes of this type, simply to keep the men going.

I do not think, considering the information that I have already given you, that there is much else to say.

Senator REED. How is this standard J machine working?

Mr. MINGLE. From the information which we have received from the field, the machine which this company is building—I am not speaking for the machines built by the Dayton Wright people or by the Fisher Body Co., but for the machines which this company has built—the plane as a plane has functioned as well as, if not better than, any training machine built in this country.

Senator REED. You say the “plane as a plane.” Do you mean with the Hall-Scott motor in it?

Mr. MINGLE. The difficulty with the plane has been the Hall-Scott engine. The Hall-Scott engine and the Curtiss engine were the only two available training engines, and the Hall-Scott engine was the only engine available for this machine. The functioning or operation of the Hall-Scott engine has never been satisfactory, but it was used because we needed the training planes and there was no other engine available.

Senator REED. Could a Hispano-Suiza engine be installed in this machine?

Mr. MINGLE. We developed and flew our training plane with the Hispano-Suiza engine in it, of 150 horsepower, in June, and that plane functioned as a plane and as an engine as well as any plane that has ever been built in this country.

Senator REED. When did you develop this plane in connection with the 150-horsepower Hispano-Suiza?

Mr. MINGLE. I should say it was about a year ago.

Senator REED. Did the Government officials know of this fact?

Mr. MINGLE. Absolutely. We flew this machine at Langley field.

Senator REED. Was the Hispano-Suiza available?

Mr. MINGLE. It was.

Senator REED. You flew it with a Hispano-Suiza engine in it at Langley field nearly a year ago?

Mr. MINGLE. Yes, sir.

Senator REED. What did the tests show as to speed, climbing ability, etc.?

Mr. MINGLE. It made 86 miles per hour. It climbed 6,314 feet in 10 minutes and 10,000 feet in 20 minutes. It made a climb of 16,000 feet in 67½ minutes with a useful load of 585 pounds.

Senator REED. Was that the standard J machine?

Mr. MINGLE. That was the standard J machine with the Hispano-Suiza engine in it.

Senator REED. With, I suppose, some slight modifications to fit the engine?

Mr. MINGLE. Some slight modifications; yes, sir.

Senator REED. Did you have any trouble with heating?

Mr. MINGLE. No, sir.

Senator REED. That was a complete success a year ago?

Mr. MINGLE. Yes, sir.

Senator REED. You further say that the Government knew about it?

Mr. MINGLE. Yes.

Senator REED. These men acting for the Government knew about it?

Mr. MINGLE. Yes, sir.

Senator REED. You further say that there were plenty of Hispano-Suiza engines available?

Mr. MINGLE. Yes, sir.

Senator REED. Have there been any serious accidents with the Standard J machine that you have made?

Mr. MINGLE. So far as I know there has never been an accident in which a man was killed because of the plane or because of the engine itself.

Senator REED. Have there been in which a man was hurt?

Mr. DAY. A machine landed in a rock pile at a gravel bed at the Wilbur Wright field and caught fire. I believe one of the men died and one was injured.

Senator REED. But that was not the fault of the machine?

Mr. DAY. No, sir.

Senator REED. I am not talking about accidents of that kind.

Mr. DAY. No Standard airplane has ever failed in the air.

Senator REED. Made by your concern?

Mr. MINGLE. Made by our concern. We are absolutely ready to back that up. We also claim that our Standard J machine, or the maintenance of the Standard J machine, is less than that of the Curtis JN-4.

Senator REED. You say you have lost 60 per cent of the utility of your plant by reason of the things you have spoken of?

Mr. MINGLE. Yes, sir.

Senator REED. And you further say you had an abundance of capital and could have magnified this plant if you had orders?

Mr. MINGLE. Yes, sir.

Senator REED. You could have extended this plant as quickly as other people?

Mr. MINGLE. Absolutely.

Senator REED. But you were not an automobile manufacturer?

Mr. MINGLE. No, sir.

Senator REED. Is it or is it not a fact that the Curtis people had good training planes?

Mr. MINGLE. Yes, sir, I think they had good training planes.

Senator REED. Your plane which they had could have been produced in quantities?

Mr. MINGLE. The difficulty was that they could not get enough Curtis engines. Therefore, they had to take the Hall Scott engine.

Senator REED. Why couldn't they have gotten the Hispano-Suiza engine?

Mr. MINGLE. They could have gotten the Hispano-Suiza engine. I believe they are now building it. The Curtis Co. is now building the Hispano-Suiza and the JN-4-H.

Senator REED. As a matter of fact, you have not enough orders to-day to go ahead? In other words, you have not enough "Go ahead" orders, so that you feel that you can organize the plant to its fullest capacity?

Mr. MINGLE. Absolutely not.

Senator REED. You are making flying boats for the Navy?

Mr. MINGLE. Yes, sir.

Senator REED. Your experience with the Navy has been what? Has it been as bad as that with the Army?

Mr. MINGLE. I would say that our experience with the Navy has been comparatively satisfactory.

Senator REED. You have spoken about being holder of all the stock except that which has been placed in the Mitsui Co. Are these other gentlemen interested with you in the proprietary holdings of the company?

Mr. MINGLE. Only Mr. Day.

Senator REED. The other gentlemen are employed by you?

Mr. MINGLE. Yes, sir.

Senator REED. Mr. Day's interest is how much?

Mr. MINGLE. I think he has an interest of 500 shares of the stock.

Senator REED. I was asked to get a complete list of the shareholders. I am going to ask you to put in a complete list.

Mr. MINGLE. Yes, sir.

Senator REED. Have you had any trouble with sabotage? Has anybody been trying to destroy the plant, or have you had any trouble with employees?

Mr. MINGLE. In the plant so far we have had no trouble.

Senator REED. Have you had any outside?

Mr. MINGLE. Several things have come in from the outside which looked as though there had been attempts to damage machines.

Senator REED. What do you mean?

Mr. MINGLE. Our turnbuckles, for instance. We discovered upon inspection that the threads had been tampered with. Had they been used on the planes, in all probability a serious accident would have occurred.

Senator REED. What is the turnbuckle?

Mr. MINGLE. It is the connecting rod.

Senator REED. That is the little screw arrangement that you twist up to tighten the cable?

Mr. MINGLE. Yes, sir.

Senator REED. Are you sure that that was not the result of an accident?

Mr. MINGLE. It does not seem to us that it could have been done in any other way than purposely.

Senator REED. Any mechanic in putting a machine together would be sure to notice it, would he not?

Mr. MINGLE. I do not think so. It was an exceptionally clever piece of work. It just happened to be caught on rigid inspection.

Mr. DAY. It was a questionable thing.

Senator REED. You say it was questionable whether it was accidental or not?

Mr. DAY. Yes, sir.

Senator REED. Do you know where you got this turnbuckle?

Mr. DAY. The Erie Specialty Co. In fact, we could not trace where we got them. We were buying from several parties.

Senator REED. I want to ask you, Mr. Day, this question. You are an engineer of many years' experience, as I understand it. Am I correct about that?

Mr. DAY. Yes, sir.

Senator REED. What is your opinion, your frank, candid opinion, of the Liberty motor? Now, I want you to be frank and candid with me, Mr. Day.

Mr. DAY. It is my frank opinion that the Liberty motor is a very good motor.

Senator REED. Do you think it is as good a motor as there is?

Mr. DAY. I would not say that I believe it is as good a motor as there is. I believe it compares very favorably with any existing motor.

Senator REED. If it compares favorably then it would be as good, would it not? What do you regard as the best aeroplane motor?

Mr. DAY. The Rolls-Royce.

Senator REED. Do you think the Liberty motor compares favorably with the Rolls-Royce?

Mr. DAY. I think it does.

Senator REED. And it can be produced much more rapidly?

Mr. DAY. Undoubtedly.

Senator REED. So that its distinct advantage, if it can be reasonably said to be equal of the Rolls-Royce in performance, is that it can be produced more rapidly?

Mr. DAY. Yes, sir.

Senator REED. And that is a great advantage?

Mr. DAY. Yes, sir.

Senator REED. Have you studied this Italian motor?

Mr. DAY. It seems to be of the very highest grade—the Fiat?

Senator REED. What about that motor as compared with the Liberty?

Mr. DAY. That is a lower powered motor, and weighs about the same. In other words, the Fiat motor is a motor of less horsepower and weighs about the same as the Liberty motor.

I want to qualify the statement that I made. The Liberty, in my opinion, is not as good a motor as the Rolls-Royce for low speed and for heavy bombing machines. I believe it as good a motor as the

Rolls-Royce for high speed machines, such as the De Haviland, or machines of that type. It is just a peculiar difference between the motors.

Senator REED. Do you think it is thoroughly practicable and dependable for bombing machines?

Mr. DAY. I do.

Senator REED. In other words, while it may not be the best, the situation is something like this: A Cadillac car will get you over the road and do the job all right; on the other hand, perhaps a Pierce-Arrow may do a smoother job, but they are both good machines; is that a pretty fair comparison?

Mr. DAY. Very good, I should say.

Senator REED. What about the heating of this Liberty motor? Do you regard that as a thing that can not be conquered, and that is peculiar to the Liberty?

Mr. DAY. It is not a matter of the motor, but rather a matter of the plane.

Senator REED. And something in the cooling system might be improved?

Mr. DAY. It might be improved, but I believe that the cooling system of the Liberty motor is satisfactory, if the motor is properly installed in the machine. In other words, I lay most of the ills of the overheating of the Liberty motor in the De Haviland machine and possibly in the Bristol, also, to the motor installation and the installation of the radiator.

Senator REED. In other words, there is still room for improvement?

Mr. DAY. Undoubtedly.

Senator REED. Have you any in mind, especially?

Mr. DAY. I have in mind some improvements that could be made to adapt it to various uses.

Senator REED. I am not going to ask for that off-hand. I am going to ask you, when this transcript is sent back here, to make those suggestions. You can make them with all the deliberation you see fit. I do not think of anything else to ask you.

Mr. MINGLE. There are one or two points that I would like to dwell upon for a moment. One is that in our opinion there should be absolute responsibility. Either the Signal Corps should be responsible for our production or we should be responsible for our production. At this moment there is divided authority. We can not determine whether we are to do it or the other man is to do it. The one thing we do not want is to be held responsible for production and not have full responsibility or full power and freedom of action. My contention has been that either we had the organization to do it, or not to do it.

Senator REED. There is another thing. You have given me a blue print showing the different places to which different materials had to be sent and from which they are sent. I wish you would, in answer to this question, state how the material reached you; that is, whether it had to be sent from one place to another. Please trace the course of these different parts as they come to you.

Mr. MINGLE. We found this, that in certain instances parts or completed assembled metal fittings were being made at three different points. In one instance a part was made in Chicago, another

part in Ohio, and still another part in Connecticut, and the three, during their tour, had to be brought together to make a complete assembly of one part.

Senator REED. Mr. Day told me in a private conversation that some of those parts had to be sent from one factory to another.

Mr. MINGLE. Absolutely.

Senator REED. And then still another.

Mr. MINGLE. Yes, sir.

Senator REED. It was that course that I wanted to have traced on the blue print.

Mr. DAY. I can say that there is a strainer nut that is used on the stream-line wires manufactured by the Torrington Co. That strainer nut is manufactured in Chicago. It is sent to Torrington to be threaded to fit the swaged wire and must then be returned to Akron, to be assembled in the strainer plate, the assembled part then being shipped to this plant.

Mr. MINGLE. There is another point that I want to call attention to. The Signal Corps has never taken advantage of the engineering facilities of the manufacturers. This is a point which I have endeavored, on many occasions, to drive home and to get action on by the Signal Corps, but until the Handley-Page machine was sent to this plant, I know of no other instance where the engineering force of an organization has been taken into consideration, in any way.

Another point is the matter of a flying field. It has been definitely settled that the plane being built at this plant must be flown for two months. Delegation after delegation has been here to decide upon a field. All are agreed upon the necessity for this, but no one will take the responsibility for settling on a field. The flight of the first Handley-Page is seriously handicapped because of this, and the flying of the De Haviland machines will also be impeded, and their shipment abroad delayed unless a field is quickly determined upon.

APRIL 9, 1918.

Mr. H. SNOWDEN MARSHALL,

Chairman Investigating Committee.

Board of Survey, Washington, D. C.

DEAR SIR: Following the recent visit of Messrs. Marshall and Wells to this plant, we beg to submit the following memorandum as to general conditions and we trust that the same will be considered from a constructive standpoint and not by way of criticism.

(1) Advantage should be taken of the engineering forces of the aircraft manufacturers. This should have been done in the very beginning, for as we are informed the experience of England has proven that this is the proper procedure. The advantages of this would be twofold:

(a) The American engineer, knowing American conditions, could put into American production machines of foreign design much more rapidly than a technical board however competent technically, but who have had no experience in the manufacture and production of airplanes.

(b) In the development of any machines or the improvement and development of machines of foreign design, the creative genius of American aeronautical engineers trained in American production should be of great benefit to the final result, the production of a superior plane.

To the writer's knowledge, until very recently the engineering forces of our country have not been given any opportunity to develop new or old ideas or to create anything on their own initiative. On the other hand, we have been directly retarded in development or experimental work.

(2) Advantage should be taken of some of the men who have had some experience in airplane production. The entire program for production has been laid out along lines of quantity production, taking as an example the automobile industry, which industry it has taken approximately 20 years to develop.

I am informed that a first-class automobile company will spend close to a year in the development of its new models before offering them to the public. We are at war, and to take a year to develop an airplane would in all ways be serious and dangerous. We should put out the best machine possible and then through production, without interfering with the same, make improvements that will go to the efficiency of the machine.

In our opinion, inspection as to materials and strength should be very severe, but the engineers of the several companies should be permitted to substitute materials of equal strength or reliability if the original specifications can not be lived up to. We should have production and not petty dickerings.

(3) The contractor should be given a go-ahead and then be permitted to develop, either in his own plant or through outside sources, means of production and then held responsible if he makes a mistake of omission or commission, rather than one of judgment.

The contractor is now looked upon as one who is trying to "do" the Government, while the Government representative feels that he is there to see that the contractor does not "get away" with it. In my opinion, the proper Government officials should determine the responsibility of the contractor and then permit him to go ahead until he has shown himself irresponsible, unreliable, and dangerous. In my opinion, in this crisis airplane engineers, production engineers, and efficiency engineers should be second to production and only made use of through production. As now operated in most plants, these engineers are retarding production and in a measure are comparable to the technical boards of the Government, in making changes absolutely inconsequential as to the functioning of the machine.

(4) The contractor, if he is reliable (and this should be determined before an order is given him and not afterwards, even though he can put up a bond) should be given continuing orders and a continuing contract. For example, our Plainfield plant will be absolutely out of work within 20 days, some of the crews already being out of work because no definite program as to training machines has been determined upon. In our opinion, no greater crime could be committed in this country than to permit in any way disorganizing our Plainfield plants and their "feeders."

(5) The contractor should be given absolutely reliable information as to the order or contract. To illustrate, a machine is said to be all ready for production. The contractor is given a large order to produce the machine. He lays out his factory, secures a large force, prepares to produce machines in quantity; and he is weeks or months in several instances to our knowledge in securing information or data upon which he can go ahead. No specifications, no bills of material, and in several instances no model machines are available. As a result, the contractor and all his force from top to bottom become discouraged, disheartened, and many of the force are endeavoring to locate themselves elsewhere where it would seem their positions would be more permanent.

The contractor at the moment has absolutely no fair basis on which to figure where or how he is going to get off, or what he can reliably depend upon. This is due to several causes:

(a) Changes in program, one machine being accepted to-day and discarded to-morrow.

(b) Changes in design.

(c) No attention being given to installation of accessories or instruments or apparatus until we are ready for it. I have seen several occasions where the radiation or the propeller or the oiling system have been given absolutely no consideration until the plane itself was ready for delivery.

The contractor, when an order is placed with him, should be given immediately all the information that the Government has relative to the machine he is intended to build and he should be told to go ahead and make his first machine, using his own judgment and that of his engineering force in the building of that machine, preparing, as he goes along, production drawings, specifications, and bills of material.

After the first machine is flown and it has proven satisfactory, or the "bugs" have been worked out of it, it should be thrown into production and no changes made that will retard production. To illustrate, the Caproni crew arrived at this plant on January 25 and we were given absolute authority, without any restrictions, to produce one machine, as the Caproni engineer and his men desired, to prepare the same for American production. Inside of 60 days we had the schedule, the layout drawings, and the metric system into the English, and

on or before May 1 the first plane should be ready for flight and production drawings complete. We have had the privilege of substituting, where materials were not available, such materials as we could locate to meet the need.

As a further illustration, the De Haviland was sent here, a model being shipped from another plant, and in 40 days we have completely built up along our own lines a De Haviland and have the plane, as a plane, ready for flight. We have not only checked up the plane which was sent here as a model, but have checked up the drawings, many of which have not been officially released to date, and we have laid down our own production drawings and have ready for production in quantity this type of plane. To-day we have no information as to installation of fighting apparatus to go ahead on, yet our plant is ready to proceed to large production.

It would seem that the authorities who should have knowledge are not given the information upon which they can reliably act. We do not mean to state that anyone misinforms us intentionally. On the other hand, we feel that they are endeavoring to give us only the information which they have received; but the parties from whom they receive the information apparently do not know what they are talking about from their own knowledge.

(6) As a final point we would say that the most important change, in our opinion, to be made is to establish in the Government a one-man power, a man who would not only have charge of production but who would have sufficient strength and power back of him to control the production as well as the technical end and to handle it as a whole and not as units. If this man is not acquainted with aeroplane production and technical points, he should have associated with him the best aeronautic engineers and the best aeronautic production men to be had in this country, men with real experience who have had the ups and downs to meet in both engineering and in production.

With one-man responsibility as to the Government there should be one-plant responsibility; that is, each plant should have absolutely unqualified responsibility for its output. The Government should not do part and the plant part. If the plant is not capable of doing it all, it certainly is not capable of doing any. The Government should render to the plant all the assistance possible in any way reasonable and just, but it should not burden the plant with supervision. The plant should be responsible also for the gathering together of all materials and parts, fabricated and otherwise. To illustrate, on the Handley-Paige job, which has not been brought to this plant: Of the 500 machines we are to build or assemble, we have been given complete authority on the erection of 1 to 25 machines only, making use as far as possible of sources developed by the Government for wood and metal parts. We as a plant have absolutely no knowledge as to the ability or capacity of the company or companies making these parts, but we are informed that in due course, when we need them, the parts will be here. We, therefore, are relieved of all responsibility of having these parts go through in their proper sequence, the Government assuming that they know when we should have them.

It is somewhat like a man building a house. If he himself subcontracts to a number of men the different jobs on the house, he is having continuous trouble whereas if he locates one contractor and makes him responsible for all subcontractors' work the result is far more satisfactory and single responsibility is placed thereby.

Attached hereto is a memorandum containing suggestions submitted to me by several of our men who have had experience in our plant as to the conditions about which they are speaking and I hand them to you for your consideration.

If there is anything else that this organization can do for you, command us. Respectfully submitted.

H. B. MINGLE.

VIEWPOINT OF THE PLANNING DEPARTMENT.

In reply to your request for a statement indicating the factors which have the most important effect on the production of airplanes from the point of view of my department, I submit the following:

It is my understanding that our contract with the United States Government allows us to build a certain number of machines of the various types without applying such changes in design as are indicated to us by the authorities in Washington during the course of construction of this specific number of ma-

changes. In other words, that changes which come in during the fabrication of a certain number of machines are not to be retroactive.

The application of this part of the contract, however, does not work out. Notification of change comes to the production department with definite instructions to withhold fabrication of various parts. Production is held up, and even if the parts were produced according to the contract arrangement, the accounting section of the Signal Corps would be unwilling to pass invoice for the parts on the ground that they had become obsolete.

It seems almost unbelievable to the writer that it is impossible to furnish us with a complete or very nearly complete set of drawings, specifications, and bills of material for the various types of machines now going into production. Certainly the machines in question have been manufactured here in this country or abroad for a considerable time, or long enough to enable the various Governments to adopt the various types in question on the basis of their performance; and if this be true it seems most unreasonable and wrong to the writer that some specific basis for the manufacture of at least a limited quantity of machines could not be furnished to this company before any changes in design become effective. However valuable a change in design may be it would seem that it were more important to build in a minimum time at least a small number of machine exactly similar to the machine which has proved extremely useful before the changes of design became effective, and to take progressive advantage of design changes rather than to attempt to apply changes in design as production on the various types in question proceeds.

A second consideration in our particular case which has directly impeded production and indirectly impeded production and affected the payment of the Government on the cost-plus contract is the accounting methods which were directed by the Signal Corps' accounts, namely, in the case of the J-1 machine, the necessity of keeping some 2,500 part costs. The detail of this work has been tremendous and has brought up so many small technical points between the company's and the Signal Corps' accounting section that the financing of the company by the Government has been seriously delayed; and this, in face of the fact that the real considerations involved were only two—namely, planes to be delivered as quickly as possible and assurance that the costs of producing these would be within reason.

The amount of detail necessitated by the above-mentioned method of cost accounting has been so great that these two main factors have constantly been lost sight of because of disagreements and bickering over small technical points. The adoption of a system of cost accounting which eliminates the vast amount of detail required for the present system and which makes it more or less impossible to bicker over small technical details, and which protects alike the interests of the Government and the Standard Aircraft Corporation, will, I believe, be a very great aid to the production and financing of this company.

PAUL D. HAWKINS.

CONSTRUCTIVE CRITICISM FROM THE PURCHASING AGENT'S POINT OF VIEW.

There does not seem to be much to say along this line at the present time. We have been gradually tearing down and building up this organization with the result that we are slowly but surely reaching the point where this proposition is clean-cut and along the lines of efficiency. There is and always will be a chance for improvement and betterment, but all these changes are being taken advantage of and followed up.

The greatest obstacle which has to be overcome and makes a great deal of unnecessary work and confusion, to say nothing of the expenditure of funds which should not be, is because of the inadequate and insufficient engineering information covering the work in production. While we appreciate that this is an unusual business which has sprung up overnight, it really seems that we should pause long enough before starting a new proposition to turn the matter over to a certain department or division who would make it their business to see that each and every item which they intend to use on the new job is really necessary and reach a final decision which would do away with the constant changes. This would take a little time which at first sight would appear to be cutting in on production. I really believe from past experience that it pays in the long run.

I do not lay the above condition strictly at the door of our own engineering department, but it should be charged up against the Engineering Division of

the Signal Corps on the combat machines. I understand the Bristol and De Haviland machines have been in this country for many months. Before the lapse of the first month the Government engineers should have had a bill of material and prints of the complete machines. These could then have been turned over direct to the manufacturer and he would have something definite to work to. Under the present system of thorough investigation of quantity, price, and propriety of all materials to be purchased which enter into the machines, there is more or less time lost which, if the Government had furnished, as they should have, a correct bill of material and prints, would be done away with. Not only is there delay but also a useless expenditure of funds. I do not mean to insinuate that the approvals officer and property officers are intentionally blocking the game, for I find that in emergencies these gentlemen stand ready to waive the necessary formalities, but they are under military law and under such are accountable for each and every act which they sanction and are, therefore, extremely cautious.

Another phase which in the past has had a tendency to retard is that of inspection. The inspection has been made in the majority of cases in the assemblers' plants. Steps are now being taken to have the inspection made on all parts wherever possible at the plant where these parts are manufactured.

This gives us a clean-cut proposition of receiving the proper goods which have met the necessary inspection and are ready to be put into our shops and assembled.

One instance which appears from the writer's standpoint will eventually be a stumbling block to a certain extent is the recent ruling of the Signal Corps furnishing certain materials and prohibiting the manufacturer from buying in the open market. While in the case of the smaller manufacturers who may not be in touch with the various sources of material and supplies this undoubtedly would be an advantage, in the case of ourselves, with the organization which we have built up for this express purpose, I believe it will work out to a decided disadvantage. While it is very well and probably a good thing for a division in Washington to keep their fingers on the pulse of any threatened shortages of certain classes of material, the manufacturers should not be compelled to place our orders with these people unless in an emergency. With the approvals officer passing on the purchases which the manufacturer makes, there is no possibility of paying exorbitant prices for the material which the Government is endeavoring to control. This situation may have its advantages to the Government and the manufacturer which will develop later and which do not appear on the face of the proposition. This is a recent ruling and has hardly had time to be tried out.

F. E. DEAN.

VIEWPOINT OF THE ACTING COMPTROLLER.

Referring to your request of even date for suggestions in connection with the requirements of the Government representatives at this plant, with a view of increasing our efficiency, I respectfully beg to submit the following:

1. *Organization of the Government representatives.*—I understand that it is the intention of the representatives of the Army and Navy to consolidate their forces and to agree on uniform methods. This should work out to decided economic advantage and I would suggest that such plans be put into effect immediately. I would also suggest that they submit to us an organization chart accompanied by a statement showing the duties and responsibilities of their various department heads. This would show at a glance to whom we should go to obtain decisions on various matters.

At the present time it is necessary to obtain the sanction of both the Army and the Navy representative in reference to certain points and in some instances their requirements are dissimilar.

2. *Current audit of our records by the Government.*—The adoption of a plan of current auditing of our records by the joint representatives of the Army and Navy. As many of their men as they might wish to appoint could be stationed in each of our departments. These men would be kept in current touch with the work and would, in fact, assist in the compilation of our records. With such a system of current auditing minor errors could be adjusted immediately. This should result in an economic advantage to the Government as well as to ourselves, as their forces could be reduced. Moreover, their auditing work would always be up to date and most of the disputed items that now drag

for weeks before being settled could be adjusted before billing is made by this company to the Government.

3. *Simplification of accounting.*—All immediate simplification of the present methods of accounting should be effected. At the present time, when it is obviously impossible for shop conditions and manufacturing methods to be ideal, we are called upon to attempt to work under an accounting system that is based on "ideals" rather than "practicability." Under present methods much valuable information can not be compiled until it is too late to be of any practical value. Further, due to manufacturing conditions, many of which are unavoidable at this time, the data that is compiled is far from accurate. In other words, we are taking so much time "splitting hairs" that we are losing sight of our real object.

I am now awaiting advice from the Army and Navy representatives for their sanction to certain methods that will afford us immediate relief. I will present more plans for further simplification shortly. As soon as we are able to get the work up to date we can lay our plans for any necessary elaboration of our system.

The plans already suggested to the Army and Navy Departments are:

(a) The establishment of an approximate general "overhead" for costing purposes. This will not only affect a considerable saving in clerical labor but will greatly expedite the determination of costs. Under the present method it is impossible to cost a part that was completed, say, on January 2 until late during the month of February. This is not in accordance with even good accounting practice. I propose to determine the actual "overhead" expense each month by departments, but not to attempt to liquidate the actual amount to each and every part. Adjustment would, of course, be made at the close of the contract.

(b) The elimination of certain copies of forms that have been requested by the Government. Much of this information can be supplied to them in a more economic way.

I wish to state that up to the present date I have been accorded the most courteous consideration by the various representatives of both the Army and the Navy with whom I have come in contact, and believe that they will sanction the plans outlined above.

Yours, faithfully,

R. A. KETTLEY.

AIRCRAFT PRODUCTION.

THURSDAY, JUNE 20, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON
MILITARY AFFAIRS,
Mineola, Long Island.

The subcommittee met in the offices of the commandant at Mineola, Long Island, Hon. Charles S. Thomas presiding.

Present: Senator Thomas (chairman), Senator Reed, Senator New, and Senator Frelinghuysen.

STATEMENT OF MAJ. ROY S. BROWN.

The CHAIRMAN. How long have you been in the aviation section?

Maj. BROWN. Since August, 1915.

The CHAIRMAN. What experience have you had since you have been in the aviation section with flying machines?

Maj. BROWN. When I left school, I went into Mexico and stayed 11 months. From there I went to the Chicago training school.

Senator REED. What were you doing before 1915?

Maj. BROWN. I was a Cavalry officer.

Senator REED. A Regular Army officer?

Maj. BROWN. Yes, sir.

Senator REED. How long?

Maj. BROWN. Since 1911.

Senator REED. Were you a graduate of the Military Academy?

Maj. BROWN. No, sir; I came up from the ranks.

The CHAIRMAN. Were you engaged in flying in Mexico?

Maj. BROWN. Yes, sir.

The CHAIRMAN. You have been a practical flyer since that time?

Maj. BROWN. I have been in practical work since I left school.

The CHAIRMAN. Since you have been connected with the aviation section, you have been engaged in teaching?

Maj. BROWN. Yes, sir; I have had a school.

The CHAIRMAN. Have you had occasion to test out or to do experimenting with the Liberty motor?

Maj. BROWN. Yes, sir.

The CHAIRMAN. At what places?

Maj. BROWN. Langley field and McCook field, Ohio.

The CHAIRMAN. How long were you at Langley field?

Maj. BROWN. Since 26th of September, 1917. I am here on temporary duty.

The CHAIRMAN. Before then you were stationed at McCook field?

Maj. BROWN. Before then at Chenute field.

The CHAIRMAN. When did you begin trying the first Liberty motor?

Maj. BROWN. I believe it was the latter part of March or the 1st of April.

The CHAIRMAN. The 12-cylinder machine?

Maj. BROWN. Yes, sir.

The CHAIRMAN. It was at Langley field?

Maj. BROWN. Yes, sir.

The CHAIRMAN. That, you think, was in April?

Maj. BROWN. The latter part of March or the first part of April.

The CHAIRMAN. And prior to that time how extensive was your experience with other machines?

Maj. BROWN. I had used different types—training types of all kinds—Martin, Curtiss, and Standard. Then there were some machines that were made for reconnoissance work by the Curtiss people.

Senator REED. What motors were in these machines?

Maj. BROWN. The Curtiss V-2-3 and the V-2-10. It is the reconnoissance type. That is an improved motor.

The CHAIRMAN. Was your experience with those motors prior to your first flight with the Liberty motor?

Maj. BROWN. Yes, sir; I had been working with them right along.

The CHAIRMAN. You have had experience with these other types of motors before and since you have flown the Liberty?

Maj. BROWN. Yes, sir.

The CHAIRMAN. By whom were you designated?

Maj. BROWN. I was officer in charge of flying at this experimental station. It is my job.

The CHAIRMAN. You are the head man, so to speak?

Maj. BROWN. It is my job to do that.

The CHAIRMAN. How many machines have you tested out?

Maj. BROWN. Five motors of different types that changes have been made in.

The CHAIRMAN. There have been changes made in the Liberty motor right along?

Maj. BROWN. Yes, sir.

Senator REED. You have tested out five Liberty motors, did you say?

Maj. BROWN. No. The first motors we had were what we call the Scupper.

Senator REED. How many did you test?

Maj. BROWN. Three. They were changed.

Senator REED. You tested out three of the Scupper type?

Maj. BROWN. Yes. That is the oil feed.

Senator REED. How did they work?

Maj. BROWN. All right.

Senator REED. Did you find some defect in them or troubles with them?

Maj. BROWN. I only flew them about in the neighborhood of 10 hours apiece. After they were sent to us we were told that they would eventually be replaced by new ones. We were given data on oil tests. At that time we went ahead and used those motors.

Senator REED. You had no trouble with the oil system?

Maj. BROWN. Well, 10 hours is not a test.

Senator REED. You mean that after 10 hours the trouble is apt to develop?

Maj. BROWN. Yes, sir.

Senator REED. What was the next batch of Liberty motors that you tested?

Maj. BROWN. The forced feed.

Senator REED. How many of those did you test?

Maj. BROWN. We have five now. This machine we have here has had in the neighborhood of 150 to 160 hours' test. We are going on from here to Chicago with it.

Senator REED. How much trouble have you had with those motors?

Maj. BROWN. We have had one case of ignition failure, but that is not the fault of the motor. All these Liberties are battery ignition. The generator feeds the battery and the battery feeds the motor. This generator failed on a long trip. Of course, that was leaving the motor run on the battery only and after a few hours of flying the battery began to get weak.

Senator REED. Do you use the Delco system?

Maj. BROWN. Yes, sir.

Senator REED. And the Delco gave out?

Maj. BROWN. No; it was the generator that failed; it was not charging the battery.

Senator REED. The generator is a thing that goes with the Delco system?

Maj. BROWN. Yes, sir.

Senator REED. It is a part of the Delco system?

Maj. BROWN. Yes, sir.

Senator REED. And the magneto is a different thing altogether?

Maj. BROWN. Yes, sir.

Senator REED. So that in this case the Delco system failed?

Maj. BROWN. The generator of the Delco system failed.

Senator REED. What was the reason?

Maj. BROWN. I do not know.

The CHAIRMAN. When was that?

Maj. BROWN. A month and a half ago.

The CHAIRMAN. Was that the only one you had that failed?

Maj. BROWN. Yes, sir.

Senator REED. Is that the only trouble you had?

Maj. BROWN. Yes, sir.

The CHAIRMAN. Do you regard that as having something to do with construction?

Maj. BROWN. I think it is a small defect in construction.

The CHAIRMAN. Did you follow that up?

Maj. BROWN. We turned it back to the Delco people. They sent it to the factory.

The CHAIRMAN. Did you follow it up in your official capacity to ascertain whether that was a thing that might occur another time?

Maj. BROWN. No; because the generator had been tested thoroughly at Dayton.

The CHAIRMAN. Is this the only time you heard of one of them failing?

Maj. BROWN. Yes.

The CHAIRMAN. Did you attribute that to something that was peculiar to that particular generator?

Maj. BROWN. I think it was a poorly made generator. We can find out exactly what happened to that generator, because the man that took it off and put it in is right here at this time.

Senator FRELINGHUYSEN. Do you generally make an official report?

Maj. BROWN. That report went to Col. Vincent.

Senator FRELINGHUYSEN. Are you under Col. Vincent?

Maj. BROWN. No, sir; Col. Patterson.

Senator FRELINGHUYSEN. You do not make reports?

Maj. BROWN. I have mechanics who go with me on the tests and who keep accurate records of everything and their report is made.

Senator REED. What motors have you used?

Maj. BROWN. The Curtiss and the Hall Scott, both four and six.

Senator REED. What is it worth? What do you think about it?

Maj. BROWN. Very unsatisfactory.

Senator REED. What is the matter with it?

Maj. BROWN. It is just poor construction. You can take a Hall Scott, for instance, from the factory, a training machine, take it down as soon as you get it, rebuild it and have it running perfectly and then you are doing very well if you make two consecutive flights. The first six times I flew one, I had to land every time. We never had any success with the six-cylinder motor, with the exception of one motor, and we had trouble with that at first. The last I heard of it, they were using it for photographic work.

Senator REED. What other motor have you used?

Maj. BROWN. The Hispano-Suiza.

Senator REED. How much experience did you have with that?

Maj. BROWN. I tested the first one we had.

Senator REED. What was the horsepower?

Maj. BROWN. One hundred and fifty.

Senator REED. Do you use this a great deal?

Maj. BROWN. Yes, sir.

Senator REED. What about that motor?

Maj. BROWN. It is a delicate motor to handle. You have got to teach the men to warm it up gradually and the trouble is that the student who is used to flying the Curtiss machine will get in and warm it up too fast. They have trouble with warping.

Senator REED. They are good motors, but they have got to be handled skillfully.

Maj. BROWN. Yes, sir; exactly.

Senator REED. It is a good training motor?

Maj. BROWN. Yes, sir.

Senator REED. You are speaking of the 150-horsepower motor, which is not powerful enough for the fighting machines?

Maj. BROWN. No.

Senator REED. Have you tried the 180-horsepower motor?

Maj. BROWN. No.

Senator REED. If they had a Hispano-Suiza motor that would develop 300 horsepower—

Maj. BROWN (interposing). It would be a wonderful motor for a single-seat fighter.

Senator REED. What other motors have you tested?

Maj. BROWN. Those are the American-made motors. Then there is the German Mercedes, used in the single-seated fighter.

Senator REED. When did you make those tests?

Maj. BROWN. At Dayton, about the latter part of April.

Senator REED. Did we have that motor in this country before we entered the war?

Maj. BROWN. No, sir. It was sent here some time during the winter. It is a captured German fighting machine.

Senator REED. What about that motor?

Maj. BROWN. You can not beat it.

Senator REED. How many cylinders?

Maj. BROWN. Six.

Senator REED. What power will it develop?

Maj. BROWN. 180 to 210.

Senator REED. You say it is a fine motor?

Maj. BROWN. Yes, sir. It is absolutely reliable. The Mercedes is practically Liberty motor. It is two motors whipped together.

Senator REED. Any others besides the Mercedes?

Maj. BROWN. The French Hispano, geared, 220-horsepower motor.

Senator REED. What is that used in?

Maj. BROWN. In the Spad fighting machine.

Senator REED. What kind of work does it do?

Maj. BROWN. Very fair.

Senator REED. That is a single-fighter machine?

Maj. BROWN. That is; yes, sir.

Senator REED. That is as good a machine as you know of?

Maj. BROWN. Yes, sir; from the experience they have had abroad using the machines.

Senator REED. What other motors?

Maj. BROWN. The British Rolls-Royce.

Senator REED. What is the power of that?

Maj. BROWN. Three hundred and sixty.

Senator REED. How did you find that working?

Maj. BROWN. A very good motor.

Senator REED. Do you know of any other better motor?

Maj. BROWN. Yes, sir.

Senator REED. What?

Maj. BROWN. The Liberty motor.

Senator REED. Did you have quite an extensive experience with the British Rolls-Royce?

Maj. BROWN. I just saw the performance.

Senator REED. You never had one in your charge?

Maj. BROWN. No, sir.

Senator REED. It flew all right so far as you observed? Has it been performing well in this country?

Maj. BROWN. So far as I know.

Senator REED. What is the thing that makes the Liberty motor superior?

Maj. BROWN. More power. It is not a geared job.

Senator REED. Do you regard it as an advantage to have it not geared?

Maj. BROWN. Yes, sir.

Senator REED. What other motors?

Maj. BROWN. The Italian Fiat.

Senator REED. How much did you use that?

Maj. BROWN. A few flights. I have had that motor under my charge for several months.

Senator REED. I am not confining your judgment to what you have done yourself, but also to what you have observed. What have you to say about the Fiat?

Maj. BROWN. They are prone to catch fire—high compression. They catch fire in starting. They are very delicate. The Italians keep working on these machines all the time.

Senator FRELINGHUYSEN. You mean that the danger of fire is in starting them?

Maj. BROWN. They wind the motor up and get the cylinders full of gas. They get a spark started and they push the gas back through the motors a second time and then it catches fire.

Senator FRELINGHUYSEN. Have there been any casualties in the air?

Maj. BROWN. No.

Senator REED. This Fiat motor, when she starts on a trip generally finishes, does she not?

Maj. BROWN. Yes, sir; but it is delicate.

Senator REED. What other motors?

Maj. BROWN. I have observed the Isoto Frasini.

Senator REED. What about that machine?

Maj. BROWN. They do less work on them than any of the Italian motors. They are very satisfactory.

Senator REED. What power?

Maj. BROWN. This special type is 160 and 180 horsepower.

Senator REED. They have more powerful ones?

Maj. BROWN. In fact, we had three that were supposed to be 300 horsepower.

Senator REED. Do you know anything about the Lancie?

Maj. BROWN. No, sir.

Senator REED. Do you not know anything about it even from other officers?

Maj. BROWN. No, sir.

Senator REED. What kind of planes have you had?

Maj. BROWN. Training planes and the reconnoissance type of machine, as well as the weight-carrying machines that you could use for bombs.

Senator REED. You have described generally the type, but what make of planes? Let us start with the training planes.

Maj. BROWN. The first training plane was the Martin model T. Then we had the Curtiss J N type, which we are now using.

Senator REED. Is that a good plane?

Maj. BROWN. For elementary training; yes, sir.

Senator REED. Do you know of any better?

Maj. BROWN. No, sir.

Senator REED. Are there any others approximately as good; if so, what are they?

Maj. BROWN. You are getting in to the question of practice. I am in favor of high-powered machines for training. My theory is that you can train a man with a sensitive machine as well as you can on the other machines. These Vought machines are used for advanced training only.

Senator REED. There are other good machines for primary training?

Maj. BROWN. Yes, sir; the Standard.

Senator REED. How does the Standard work?

Maj. BROWN. It is not a good training machine for the reason that the motor equipment is the 4-cylinder Hall Scott.

Senator REED. If they had a good motor the machine would be all right?

Maj. BROWN. Yes, sir. I do not think it is as good as the Curtiss, but it can be used with good results. Any machine that is built on conventional lines can be used for training.

Senator REED. The Standard plane equipped with a Hispano-Suiza motor would be all right.

Maj. BROWN. Oh, yes, sir.

Senator REED. Getting out of the primary training class and coming to the advanced training planes, what are the good types of machines?

Maj. BROWN. For advance training, take the Thomas-Morse built around a Gnome motor.

Senator REED. How does it work?

Maj. BROWN. It is a good machine, but the motor is not good. It is prone to catch fire. It is very delicate. Lots of times they stop in the air and let you come down. Then there is the Vought training machine. The Curtiss people made two types, one with clipped wings. It climbed too slowly; there was too much weight; it did not have the performance of the Vought.

Senator REED. You found the Vought one of the best?

Maj. BROWN. Oh, a wonderfully good machine.

Senator REED. Do you regard that as an advanced training plane?

Maj. BROWN. Yes, sir.

Senator REED. What is the matter with it for a fighter?

Maj. BROWN. It is not fast enough. It would not climb over 10,000 feet.

Senator REED. In other words, it has its limitations.

Maj. BROWN. Yes, sir. It is a machine for advanced training only.

Senator REED. What other machine do you regard as approximately in the same class?

Maj. BROWN. None.

Senator REED. How many Vought machines have you?

Maj. BROWN. I think we have ordered 1,500. At that time we only had one.

Senator REED. Let us proceed from advance training planes to the fighter, the single-seated fighter.

Maj. BROWN. We have developed none in this country that I know of.

Senator REED. What is the best one that you know?

Maj. BROWN. The best machines are the Spad and the German Albatross.

Senator REED. Is anybody making the German Albatross in this country?

Maj. BROWN. No.

Senator REED. In your opinion, the Spad is the best single-seat fighter?

Maj. BROWN. Yes, sir.

Senator REED. What engine is used?

Maj. BROWN. The Hispano-Suiza.

Senator REED. Is that a good engine?

Maj. BROWN. Yes.

Senator REED. Do you know of any engine that is equal to it?

Maj. BROWN. No.

Senator REED. For the single-seat fighter the best motor you know is the Hispano-Suiza?

Maj. BROWN. Yes, sir; that is for a reciprocating motor and not a rotary motor.

Senator REED. And the best plane you know of, unless it is the German Albatross, which is not being produced in this country, is the Spad?

Maj. BROWN. Yes.

The CHAIRMAN. How about the S E-5?

Maj. BROWN. It is very much like the Spad.

Senator REED. Have you tried them out?

Maj. BROWN. Yes.

Senator REED. To what extent?

Maj. BROWN. Two flights.

Senator REED. A moment ago you said the Hispano-Suiza was the best reciprocating engine, and then you mentioned another type of engine.

Maj. BROWN. Yes. A great many people are in favor of a rotary motor for a single seater.

Senator REED. What motors are those?

Maj. BROWN. The Le Rhone and Gnome. The big Gnome I have not seen. It is different from this. The Le Rhone I have had under observation for several months. It is a very satisfactory rotary motor.

Senator REED. Do you know whether it can be produced in quantities rapidly?

Maj. BROWN. I understand that they are producing 80-horsepower motors in this country. They are producing the Le Rhone 80-horsepower motor in this country.

Senator REED. I am asking about quantity. There are certain ones that can be made by machinery, while others have to have a great deal of hand work. Do you know what the characteristics of the Le Rhone are?

Maj. BROWN. As far as production goes?

Senator REED. Yes.

Maj. BROWN. No, sir; I do not know that.

Senator REED. You have spoken of the Spad as a single-seat fighter. When you go above the single-seat fighter, what is the next type of machine?

Maj. BROWN. You have the two-seat fighter that is used for reconnaissance.

Senator REED. What is the best type of machine of that kind.

Maj. BROWN. The D. H.-4.

Senator REED. Do you say it is the best we have in this country?

Maj. BROWN. Yes.

Senator REED. Have you tried out those of other countries?

Maj. BROWN. Yes.

Senator REED. What others?

Maj. BROWN. The Italian S. I. A. and the Pamleio.

Senator REED. I am asking about the characteristics of these foreign-made machines as compared with the J. N.-4 which we have been told is the best machine.

Maj. BROWN. The J. N.-4 is a training machine.

Senator REED. What was it you said a moment ago? What was the machine you said was the best two-seated fighter?

Maj. BROWN. The D. H.-4. That is a British type of machine.

Senator REED. The De Haviland is the best we have in this country. I will ask you now to compare it with foreign makes with which you are familiar.

Maj. BROWN. It is away far and above those two Italian machines.

Senator REED. Do you regard it as the best machine?

Maj. BROWN. It is the best machine on hand. I think a better machine can be built. I think it is the best machine that is used by any nation at the present time.

The CHAIRMAN. Have you tried the Bristol?

Maj. BROWN. That is a De Haviland two-seater machine; it is used for everything.

The CHAIRMAN. That is equipped in England with what machine?

Maj. BROWN. It is equipped with the Rolls-Royce. It was equipped at one time with a peculiarly named 6-cylinder motor.

The CHAIRMAN. Have you tried it in this country with the Rolls-Royce machines in it?

Maj. BROWN. Yes, sir.

The CHAIRMAN. And also with the Liberty motor?

Maj. BROWN. Yes, sir.

The CHAIRMAN. How do they compare?

Maj. BROWN. The Liberty motor is of much greater power.

The CHAIRMAN. Have they got it so it is balanced up?

Maj. BROWN. Yes, sir.

The CHAIRMAN. Did you have any trouble with the Rolls-Royce?

Maj. BROWN. Overheating.

The CHAIRMAN. Have you had the same trouble with the Liberty motor?

Maj. BROWN. If you fly close to the ground.

The CHAIRMAN. Why don't you have that trouble with the Rolls-Royce?

Maj. BROWN. You will.

The CHAIRMAN. Do you mean to say that the Rolls-Royce would heat as much as the Liberty motor would heat?

Maj. BROWN. I think so. They are constructed in about the same way, as far as the radiation goes. Those machines are so built that if you run close to the ground on a warm day they are going to get hot.

The CHAIRMAN. In your opinion is the Liberty motor as good a motor as the Rolls-Royce?

Maj. BROWN. I think it is much better.

The CHAIRMAN. With the exceptions you have named and the difficulties you had at one time with the generator, have you had any serious trouble with the Liberty motor?

Maj. BROWN. Not a bit.

The CHAIRMAN. You have been using it continuously for months?

Maj. BROWN. Yes, sir.

The CHAIRMAN. And you unhesitatingly approve it?

Maj. BROWN. Absolutely.

The CHAIRMAN. You are willing to make that statement, Major, even with a full knowledge that the report of this committee may have a good deal to do with production and conditions?

Maj. BROWN. Yes, sir. I have flown that machine in a fog. That is about the most dangerous time to fly any machine. I made a long trip of about 150 miles with a Liberty motor. If you got 150 feet from the ground you could not see the ground. I crossed Chesapeake Bay about 150 feet from the ground. If I had not had the greatest confidence in that motor I would have stopped.

Senator REED. You were flying low?

Maj. BROWN. Yes. If your motor stops over Chesapeake Bay, even if a ship was there, it probably could not see you in a fog. We came up in a thunderstorm and climbed through a cloudburst, and she never missed a stroke.

Senator REED. Have you flown the motor equipped with what is called a military load?

Maj. BROWN. Not exactly. A military load would be munitions and everything weighed up to a certain capacity for that machine. I have flown a Liberty motor with more than a military load.

The CHAIRMAN. What speed have you been able to make with the machine loaded to that capacity?

Maj. BROWN. Well, this machine that I have here is not as fast as some that you can use. It only makes about 115 miles an hour.

The CHAIRMAN. What is the type of machine which is equipped with the Liberty motor here?

Maj. BROWN. That is the mail-carrying machine. That is the type I was speaking of.

The CHAIRMAN. That is the slow machine?

Maj. BROWN. Yes, sir.

The CHAIRMAN. Is it slower than the De Haviland?

Maj. BROWN. Yes, sir.

The CHAIRMAN. You say that so loaded you made 115 miles an hour?

Maj. BROWN. Yes, sir.

The CHAIRMAN. Was that an average?

Maj. BROWN. That was the maximum speed.

The CHAIRMAN. What was the minimum?

Maj. BROWN. You can throttle it down to about 75 miles.

The CHAIRMAN. Were you trying to make the best speed then?

Maj. BROWN. No.

The CHAIRMAN. Have you ever tried to make, so loaded, a maximum speed?

Maj. BROWN. Yes, sir. I flew from Hampton to Washington a couple of weeks ago in 1 hour and 15 minutes, a distance of 140 miles.

The CHAIRMAN. Were any official records made of those flights?

Maj. BROWN. No; it was just for our own information. We had to come up to Washington.

The CHAIRMAN. What machine was that?

Maj. BROWN. This same sort of type.

The CHAIRMAN. Did you have then as heavy a load?

Maj. BROWN. 140 gallons of gas, 6½ gallons of oil, and an observer.

The CHAIRMAN. What is your opinion of the present cooling system of the Liberty motor?

Maj. BROWN. It is all right.

The CHAIRMAN. You think the radiator surface is sufficient?

Maj. BROWN. For the purpose for which they are using it—for high altitudes.

The CHAIRMAN. A system which might be good at a high altitude might not be good at a low altitude.

Maj. BROWN. Yes, sir.

The CHAIRMAN. In other words, the engine should be equipped with such a cooling system as will accommodate it to the altitude that it is designed for?

Maj. BROWN. That is the idea. There is no sense in carrying a big radiator that is going to keep you down to the ground.

Senator REED. But you must be there to start.

Maj. BROWN. But you can nurse it through that.

The CHAIRMAN. Can you take the Liberty motor and make an unbroken upward flight, say 10,000 or 15,000 feet, without overheating the engine?

Maj. BROWN. Not on a real hot day. You can do it if you want to take a chance of putting the motor on the bum.

The CHAIRMAN. Is not that the test of a good, first-class engine for a fighting machine?

Maj. BROWN. It is better to have that, but you can throttle this motor at 1,500 revolutions and keep close to the ground.

The CHAIRMAN. Isn't that a disadvantage in an engine which equips a fighting plane, to step up?

Maj. BROWN. Yes, sir. It would be better to do that than to sacrifice speed and add on weight by putting on more radiating surface.

The CHAIRMAN. Is it not a fact that with the Hispano-Suiza engine it is possible to make an upward flight without stepping?

Maj. BROWN. Yes, sir.

The CHAIRMAN. The Liberty motor can not be used in the lighter machines?

Maj. BROWN. No, sir.

Senator FRELINGHUYSEN. Doesn't the De Haviland four with a Rolls-Royce gain altitude without stepping?

Maj. BROWN. Yes, sir; and so will the De Haviland with the Liberty motor.

Senator FRELINGHUYSEN. So does the De Haviland with the Liberty motor?

Maj. BROWN. Yes, sir.

Senator FRELINGHUYSEN. Does the Brequey gain altitude?

Maj. BROWN. I do not know.

Senator FRELINGHUYSEN. You stated that you made these tests. Is this your personal experience, or your official records of tests?

Maj. BROWN. Which ones do you speak of?

Senator FRELINGHUYSEN. The tests of the Liberty motor?

Maj. BROWN. They are my own experience.

Senator FRELINGHUYSEN. You made no official report?

Maj. BROWN. We report a certain number of hours at such and such an altitude.

Senator FRELINGHUYSEN. You have not weighed the loads so that you know the load is equal to the military load?

Maj. BROWN. It is heavier. This D. H. 4 will carry in the neighborhood of two hours of fuel.

Senator FRELINGHUYSEN. Let us get at it in another way. What does the De Haviland four with a full war load weigh?

Maj. BROWN. I could not say.

Senator FRELINGHUYSEN. What did the De Haviland four with the Liberty motor and the load you carried weigh?

Maj. BROWN. I am flying the Curtiss.

Senator FRELINGHUYSEN. These official tests were all with the De Haviland?

Maj. BROWN. I never tried to compare these Curtiss machines that would be used at the front.

Senator REED. Maj. Brown, what is your radius of flight with the De Haviland machine equipped with a Rolls-Royce motor? What I want to get at is this: I will state it plainly so that you can catch the point. It is claimed by the critics of the Liberty motor that it consumes oil and gas so rapidly that its radius of flight is less than of other engines, because in order to have enough they start with an enormous load of gas. What about that?

Maj. BROWN. This special one that we have here uses between 32 and 35 gallons an hour, wide open.

Senator REED. What does the Rolls-Royce use?

Maj. BROWN. I do not know.

Senator REED. You use about how many gallons an hour?

Maj. BROWN. Between 32 and 35, wide open.

Senator REED. Of course, if you throttle it down, you would not use so much?

Maj. BROWN. The economic speed is about 1,500 revolutions per minute.

Senator REED. Do you know about the gas consumption of those other types of machines outside of the Rolls-Royce? Do you know how much oil the Liberty motor consumes?

Maj. BROWN. Between 5 and 6 quarts an hour.

Senator REED. So that you have to use about 32 gallons of gas and 6 quarts of oil an hour?

Maj. BROWN. That is, wide open.

Senator REED. Wide open?

Maj. BROWN. The motor is turning sometimes as high as 1,700 revolutions per minute. You are developing an awful lot of horsepower.

Senator REED. As a matter of fact, when you are loaded with gasoline and oil, with a machine of ordinary capacity, using the Liberty motor, two hours' flight is about all you can expect.

Maj. BROWN. With this D. H.?

Senator REED. Yes, sir.

Maj. BROWN. Yes, sir.

Senator REED. Isn't that a pretty short flight for a battle front?

Maj. BROWN. Yes, sir; I think so.

Senator REED. In your opinion you need an additional load?

Maj. BROWN. Especially for reconnoissance work.

Senator REED. A load of oil?

Maj. BROWN. Yes, sir.

Senator REED. Can you carry it?

Maj. BROWN. At the sacrifice of other stuff.

Senator REED. That is, munitions, bombs, and things of that kind?

Maj. BROWN. Yes, sir.

The CHAIRMAN. And speed?

Maj. BROWN. Not necessarily.

Senator REED. Have you had or used the Caproni machine to any extent?

Maj. BROWN. No, sir.

Senator REED. Who has been doing the work?

Maj. BROWN. The Italians.

Senator REED. They are here?

Maj. BROWN. Yes, sir. At this field they have a school for Caproni pilots. Some of the men who have graduated from school are learning here.

Senator REED. Have you observed the Caproni?

Maj. BROWN. Yes, sir; I have the first one.

Senator REED. What is your opinion of the machine?

Maj. BROWN. It is a big, heavy weight-carrying machine.

Senator REED. How much will it carry?

Maj. BROWN. I have no idea.

Senator REED. It is not a fast machine?

Maj. BROWN. No; it is for bombing at night.

Senator FRELINGHUYSEN. Is the only heavy bombing machine you have got here the Caproni?

Maj. BROWN. Yes, sir; we have the D. H. 2.

Senator FRELINGHUYSEN. That is the D. H. 4.

Maj. BROWN. Yes, sir.

The CHAIRMAN. Maj. Brown, we are very much obliged to you for this statement.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

THURSDAY, JUNE 20, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Mineola, Long Island.

The subcommittee met in the officers' quarters at Mineola, Long Island, Hon. James A. Reed presiding.

Present: Senators Reed and Frelinghuysen.

STATEMENT OF CAPT. UGO D'ANNUNZIO.

Senator REED. Will you please give your full name, your place of residence and your rank in the Italian Army?

Capt. D'ANNUNZIO. Capt. D'Annunzio, the Ritz Carlton Hotel, New York City, of Milan, Italy.

Senator REED. You are a captain in the aviation branch?

Capt. D'ANNUNZIO. In the technical direction of aviation. A captain in the Italian Army, on the technical board of aviation. I have been chief engineer of the Caproni plant in Milan.

Senator REED. Were you connected with the army before Italy entered the present war?

Capt. D'ANNUNZIO. Yes, sir; since 1910.

Senator REED. Are you a graduate of the Italian military school?

Capt. D'ANNUNZIO. No; I am a reserve officer.

Senator REED. You are by profession a mechanical engineer?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. You have been studying aviation how long?

Capt. D'ANNUNZIO. Well, I was, the first time, interested in aviation in 1909.

Senator REED. You are thoroughly familiar with the Caproni machine?

Capt. D'ANNUNZIO. Especially with the Caproni; as I have been two years an engineer in the main plant in Italy.

Senator REED. You are also acquainted with the other types of Italian machines?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. You have had an opportunity to at least observe the performances of machines made by other nations?

Capt. D'ANNUNZIO. Of course, and especially French machines, because we built French machines in Italy.

Senator REED. Your present mission in America is what?

Capt. D'ANNUNZIO. Last October, I think it was, there was a kind of International Conference in Paris with Americans just to

make a general aviation program. Mr. Caproni was required to come to Paris. At that time Col. Bolling was one of the heads of the Aviation Section in Paris. The American Military Mission or Aviation Mission, in Paris, France, made a proposition at that time to adopt the Caproni bombing planes for the United States Army. Col. Bolling made a kind of agreement with Mr. Caproni, and Mr. Caproni agreed with him to furnish him drawings and also skilled engineers, with possibly some workmen from his own plant to facilitate the construction of his own machines, the Caproni machines, in America. I was then asked to come to Paris. I was director of the plant in Milan. They wired me to come at once to Paris to get in touch with the American Mission, and I was picked out by Engineer Caproni to come here and represent him in technical matters. When I came to Paris the arrangements between Col. Bolling and Mr. Caproni seemed to have been finished. Engineer Caproni expected to give his patents free to the United States, and the United States was to have as many Capronis of the required kind as they wanted. They also made an agreement that these Caproni machines would be assembled in an American plant to be built at Bordeaux. Mr. Caproni had to give his patents to the United States for nothing, because at that time Col. Bolling claimed that the United States did not want to pay any royalties for machines to be used in the war. They made an agreement that the assembling of the American Caproni would be done in the plant I have mentioned under the technical direction of Mr. Caproni himself or some man in his factory, and that Mr. Caproni would furnish a certain number of workmen and engineers just to constitute a kind of nucleus for the workmanship of that big American plant. For that work of helping to assemble the machines, Mr. Caproni would be paid so much per machine.

Senator REED. Do you remember how much?

Capt. D'ANNUNZIO. I do not remember.

Senator REED. That was intended to give Mr. Caproni a little profit.

Capt. D'ANNUNZIO. Yes, sir; because they could not give a direct royalty. At any rate, his technical assistance was required in France to assemble the machines, so that they found that way to give a little profit. That program seemed to be definite, so I went back to Italy to prepare my drawings and get a couple of sample machines to bring here. When I had finished I went back, about three weeks after that, to Paris. It was in December, the last days of December. I did not meet Col. Bolling again, because he was with Gen. Pershing, but I met Col. Waldon, who is at present here in America. I will say that from Col. Waldon I had the impression that all was prearranged here in America so that we could go right away into production of the Caproni machines. Mr. Caproni himself was so sure that he said, joking to me, "You will go to America and have a good rest; you have only to explain the drawings because all the plans are prepared for you; you can help them to start production."

So I came here to America.

Senator REED. When did you come?

Capt. D'ANNUNZIO. The 17th of January of this year. I had with me about 19 men of the best of our factory. They are now

working on that American machine. I had with me two sets of Italian drawings, Vandykes, and about five sets of blue prints of the same machine. Of course, they were all in Italian measures. I came here and went to Washington directly and visited Col. Deeds and Mr. Coffin. Right away I was sent back to the Standard Aircraft Corporation, in Elizabeth, N. J. I do not remember what American officer came with me to show me the plant. They asked me if I thought that plant would be good for the Caproni machine.

I had informed myself in Washington, and I heard that the Standard at that time was the only plant that was free for work, because the Curtiss plant had other machines to make which took up the resources of that plant. The two plants which were larger than the Standard were the Curtiss plant and the Dayton-Wright plant, and they had been taken up with orders. There was nothing to do except to accept the Standard plant, because there was no other plant free. Of course, I observed right away that the plant was not at that time very well prepared for the construction of big machines like the Caproni, but all the people assured me anyhow that they would, during the preparation of the drawings, be able to construct more buildings and bigger ones, according to the big dimensions of our machine.

Senator REED. Who assured you of that?

Capt. D'ANNUNZIO. Mr. Mingle, the president.

Senator REED. Mr. Mingle told you that he would, while the drawings were being worked out and those other matters attended to, build a building suitable for that?

Capt. D'ANNUNZIO. Yes, sir. Then I began right away to get out my drawings and make preparations for the translation of the Italian measures into American measures. Then I went to Washington to see how many machines we should build, but for about three or four months they were not decided. Here in Washington I found quite other conditions than the conditions they had told me I would find when I was in France.

Senator REED. What conditions did you find?

Capt. D'ANNUNZIO. I thought I would just go into production for a certain number of machines. In Washington they did not seem to have decided upon not only the number, but upon the acceptance of the type of machine.

Senator REED. Let me translate this to see if I have your meaning. When you went to Washington, after you came to this country, you expected to find the American Government ready with factories capable of producing your machine?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. And needing only instructions?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. You expected to find them ready to produce?

Capt. D'ANNUNZIO. I expected also a program to be fixed.

Senator REED. You expected there would be a definite program for making machines within a certain space of time?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. When you got here the first thing they did was to ask you whether the Standard plant was suitable?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. You went and inspected it and you found they did not have buildings large enough for the large Caproni machines, but you were assured by Mr. Mingle that he would build the hangars while your plans, which were made out according to the metric system, were being translated into American measurements?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. You then went back to Washington and found out that the only place you could get was the Standard and that you had no other choice, because the other plants were being taken up with other orders?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. And you were saying, when I started to ask you this question, that you also found that our Government had not definitely made up its mind to build the Caproni machine?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Or, how many they would build, if they built any?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Will you please tell us now what your difficulties have been?

Capt. D'ANNUNZIO. Then I went to the Italian military mission. I said, "I am rather astonished at the situation." I thought that between Col. Bolling in Paris, representing the American Government, and Col. Deeds and Mr. Coffin, that had been prearranged for me and that everything would be ready upon my arrival. They were always wiring and cabling to Italy asking for the engineer of the Caproni plant who was to come here. I requested Gen. Tozzi, who is the head of the Purchase mission in Washington, to help me to clear up the matter. So we provoked a lot of meetings between myself, Col. Deeds, and some other officer. I think sometimes Col. Montgomery was also there, but after each meeting it was just the same as before, because no decisions were reached. Not only that, but I found that they were undecided as to whether they should make that machine, although demonstrations had been given before the European military mission, which was sent expressly to our plant in Italy. The whole mission made a three-hour flight to the front without stopping. At the front they saw the bombing machines start off for a bombardment, and they came into the factory and looked at the drawings. It seemed to us that there was no discussion about it, but when I came here they did not know whether to make the Handley-Paige or the Caproni, or both.

Senator REED. Did they want you to make demonstrations?

Capt. D'ANNUNZIO. Then they came to a determination to build one experimental machine, a Caproni, for American engines. So, then I went back to the Standard and began to prepare drawings and get materials to start that first machine. That first machine was done by hand.

Senator REED. When was it that they finally authorized you to go on and build that first experimental machine for American engines?

Capt. D'ANNUNZIO. That was to arrive very soon, about two weeks after my arrival, or about the 1st of February. The effort to build the first experimental machine was not much less of an effort than it would have required to start production.

Senator REED. That is to say, you could have, with the same amount of effort that you had to put forth to build one experimental machine, started in production if there had been no changes made?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. But they wanted you to make an experimental machine so that they could put American motors in it?

Capt. D'ANNUNZIO. Yes. The changes are such that we could have started in production with a big part of the machine, you know, leaving all the parts connected with the engine back until——

Senator REED. You could have started work and progressed to a certain point. You could have built wings and other parts of the machines?

Capt. D'ANNUNZIO. Yes, sir; the tail planes, rudders, fuselages, landing gear, struts, interplane cables, pins, bolts, turnbuckles, etc.

Senator REED. And you could have had those ready?

Capt. D'ANNUNZIO. Yes, sir. I proposed to go on with the production and to go on with the experimental machines up to the limit of the modifications that were to be made in order to suit the new engines to the machine.

Senator REED. How long was it that you were actually delayed so that you did not get to a real result? As a matter of fact, you are building your first machine now, are you not?

Capt. D'ANNUNZIO. The first machine will be ready to fly for the 4th of July. I am now trying to get a night shift, because I would like very much to fly by the 4th of July, as it is an American machine, equipped with American engines, the Liberty engines, and manufactured here in America.

Senator REED. Will that be the first Caproni that has ever used the Liberty motor?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. What was the engine that you used in the Caproni?

Capt. D'ANNUNZIO. The Fiat.

Senator REED. Could these Fiat engines have been procured and put into the Caproni so as to reproduce them as you had them in Italy?

Capt. D'ANNUNZIO. That was the first requirement when we went to Paris, and we suggested it was best to take the engine and the plane together.

Senator REED. Could a Fiat motor be produced in the United States, or in Italy alone?

Capt. D'ANNUNZIO. It was produced in Italy alone.

Senator REED. Was there an Italian manufacturer who could have produced them in Italy and sent them to this country fast enough to supply these planes?

Capt. D'ANNUNZIO. I do not think so.

Senator REED. So that, as a matter of fact, in order for the United States to use this Caproni machine in numbers, they would have to make their own engines?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Did the Fiat Co. offer to come here and establish a plant?

Capt. D'ANNUNZIO. I do not think so. I think I can exclude that; but anyhow we were right well satisfied, Mr. Caproni and myself,

when they showed us in Paris the results of the Liberty engines, and Mr. Caproni was convinced they would have fitted very well.

Senator REED. You have been here working around this engine quite a while?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. What is your opinion of the Liberty motor?

Capt. D'ANNUNZIO. My opinion of the Liberty motor is that it is a production engine, an engine built in such a way as to make very easy big production. I think it has had in the last two months very important improvements. When I arrived in this country I was not very optimistic. When I saw the engine I said, "Well, if I have to put those engines in my machines, the result will not be very good"; but I must say that in the last two and a half months they have done things which have improved the motor.

Senator REED. You mean that in the last two and a half months there have been fine improvements made in the Liberty engines?

Capt. D'ANNUNZIO. Yes, sir; so that I think that when we start with the production of our planes, we will have a very satisfactory machine.

Senator REED. Are you pretty confident that you will be able to put them in your planes without further experiment?

Capt. D'ANNUNZIO. Yes, sir, because of the information I have picked up with regard to these engines. The Liberty is built in two types. The Army type is high compression; the Navy type is low compression. The Navy has at 1,600 revolutions per minute about 20 or 25 horsepower less than the Army type. I think that at present it is safer. They have less accidents with it than with the Army type. In order to make the first flight I preferred to have the Navy type.

Senator REED. The plane that you are building here is equipped with three Liberty motors?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. What is going to be the speed?

Capt. D'ANNUNZIO. With a full load, about 100 miles per hour.

Senator REED. With three low-compression Liberty motors?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. That is the type used by the Navy. It would make 100 miles an hour with a full military load?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. What will be the full military load on that machine; how much would it weigh?

Capt. D'ANNUNZIO. The American Caproni will have five hours air endurance at full speed.

The CHAIRMAN. How many gallons of gasoline?

Capt. D'ANNUNZIO. I will have to give you that later.

The CHAIRMAN. We are going to send you this testimony and ask you to correct it.

Capt. D'ANNUNZIO. Then I will put in the details.

(Capt. D'Annunzio submitted the following statement:)

The Liberty-Caproni has a gasoline tank of actual capacity of about 410 gallons and an oil tank capacity of about 45 gallons. Using the engines at about 1,600 revolutions per minute (developing 330/335 horsepower), considering an average consumption not larger than that of European aviation engines, considering also the decreased consumption at the altitude which the pilots must

maintain in order to safely reach the target (generally not lower than 10,000 feet), the fuel capacity as above given should be abundantly sufficient for a five-hour flight. Practically the distribution of the useful load varies according to the distance of the target. It is understood that should the target be nearer than the maximum range of the machine the weight of the excess in fuel is to be substituted by an equivalent weight in bombs. In other words, the longer the distance of the target the more the fuel and the less the weight of bombs.

Following the death of our pilot while on a scout machine, it has been impossible for us until to-day to perform any test which would practically indicate the consumption of the engines and give us the opportunity to limit it to the same average of our motors in order to save as much weight as possible for the bombs. However, it is almost safe to indicate a total useful load of about from 4,600 to 5,000 pounds to be carried at an average speed of about 100 miles.

With reference to the arming, owing to the fact that the machine is to be mostly used for night bombing (as for bombing in the daytime the machines are generally convoyed by smaller machines) arrangements for only four machine guns have been made.

The crew is to consist of two pilots, one observer, who is also to act as front gunner, and one rear gunner.

As to climbing, we may foresee by full military load the following times of climbing: At 3,250 feet in about 6 minutes; at 6,500 feet in about 14 minutes; at 10,000 feet in about 25 minutes. The above to be considered as approximate and as an average.

The CHAIRMAN. Please state at this point in your testimony, when the notes are returned to you, in detail, the capacity of this Caproni machine to which we have been referring, giving its speed, the hours it can be kept up, the amount of gasoline it will consume, and the amount of oil, together with all other details of a similar character, and all performance records.

Capt. D'ANNUNZIO. What made my work rather difficult was the big consumption of the Liberty motor in gasoline and oil compared with our Fiat engines.

The CHAIRMAN. How much greater is it?

Capt. D'ANNUNZIO. I can not tell exactly. It is about one-eighth bigger.

The CHAIRMAN. How about the power of the Liberty engine as compared with the Fiat engine, pound per pound?

Capt. D'ANNUNZIO. The Liberty engine is better.

The CHAIRMAN. It is better?

Capt. D'ANNUNZIO. Yes, sir; it is better. It will always become better. I mean it will improve, and within three or four months the Liberty engine will be a very good engine for aviation, if they succeed in limiting the consumption, because you have a light engine, but you must have big tanks.

The CHAIRMAN. If you have a light engine and have to carry a lot of oil, it does not help?

Capt. D'ANNUNZIO. Yes; and then there is the cooling system.

The CHAIRMAN. What about that?

Capt. D'ANNUNZIO. I will show you after a while. I will show you the radiator we use for the same horsepower Fiat and the radiator we use for the Liberty.

The CHAIRMAN. What is the difference?

Capt. D'ANNUNZIO. There is a difference of one third of surface.

The CHAIRMAN. You mean by that that the radiator of the Liberty motor must be one-third larger than the radiator on the Fiat motor, when we consider motors of the same horsepower?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. What is the reason that is true? Do you know? Have you any opinion about it?

Capt. D'ANNUNZIO. My opinion is that the thickness of the jackets on the head of the cylinders is not what it should be. It seems to me, compared with other engines, that it is too thin. As a whole, I have the impression that the internal water circulation is defective.

Senator REED. You think that the water inclosed between the water jackets and the cylinder, at the head of the cylinder is too slight; that there is too little water there; that there should be more water at that point?

Capt. D'ANNUNZIO. I am not an engineer. I am an engineer of aeroplanes. As to aeroplanes, I can freely give my opinion, but I am not competent to speak of engines. Therefore, my opinion in the matter of motors can have but a slight interest for you.

The lubrication seems to me to be also not very much improved. As on the Caproni I found it necessary to cool the oil separately so as not to let it become too hot and lose its viscosity.

Senator REED. The oil should be separately cooled. At present it gets overheated, and returning in that heated state does not cool the engine?

Capt. D'ANNUNZIO. Above a certain temperature the oil loses its lubricating qualities.

Senator REED. It loses its lubricating effectiveness?

Capt. D'ANNUNZIO. Yes, sir; it becomes too thin.

Senator REED. To state it again, what you mean to say is that when the oil gets overheated, putting your answer in plain terms, it loses its lubricating qualities to a large extent?

The CHAIRMAN. It loses what they call its viscosity. Is there anything else that you think of that you can suggest, Captain?

Capt. D'ANNUNZIO. I am now rather optimistic about that engine. I had prepared two months ago propellers for that engine to use it at that time in a safe manner. I thought it would be safe to use then the Liberty engine with a bombing machine, I mean with a machine which is able to stay in the air generally not less than 4 hours at 1,500 or 1,600 revolutions per minute only, but since the last results of the tests in Cleveland I am encouraged to make an attempt to use the engine at about 1,650 revolutions per minute.

The CHAIRMAN. That will give you much more speed?

Capt. D'ANNUNZIO. Not so much more speed, but better climbing. It will give me greater loading ability, if necessary, because of this increase of power. It makes your climbing better.

The CHAIRMAN. Have you gotten yet any directions to build the Caproni machine in quantity?

Capt. D'ANNUNZIO. Yes, sir.

As soon as the Aircraft Board was changed I was called to Washington to Mr. Potter. We had a meeting before that. We had a meeting under the direction of Col. Deeds.

Senator REED. Who had the meeting?

Capt. D'ANNUNZIO. It was in Col. Deeds' office, but not at Nineteenth and D Streets. It was close to the Willard Hotel. Gen. Squier held the meeting, but he was not present. Col. Deeds was president of the meeting. I can tell you exactly the date.

Senator REED. Will you please fill in the date when your testimony is returned to you?

Capt. D'ANNUNZIO. Yes, sir. The meeting was held on April 10 and it was resolved to propose the construction of 250 Caproni machines. I will give you a copy of what they decided in that meeting. They decided to accept the Caproni machine. That is a very important meeting, because this meeting was the first in which they decided to build the Caproni, officially, in Washington, and it was a big step for us, because until then we were working and did not know what for.

Senator REED. How many have been ordered?

Capt. D'ANNUNZIO. Then came the new administration and Mr. Potter has now ordered about 500 from the Fisher Body Corporation, which has a very good plant, in my opinion. I visited it because Mr. Potter asked me to go there and look at the plant. I was very well satisfied with that plant, which is, in my opinion, the best here in the United States. They have also ordered 500 from the Curtiss Co. I must say that when this decision was reached, I opposed giving the order to the Curtiss Co., for a number of reasons. First, because I read in the papers the stories about a poor organization at the Curtiss plant, and I heard the statements made in the Senate about the Curtiss plant.

Senator REED. You mean that there was German influence out there?

Capt. D'ANNUNZIO. Yes, sir. I heard the story of the fittings having been destroyed.

Senator REED. Sabotage, we call it.

Capt. D'ANNUNZIO. Yes, sir; and I heard specially about there not being a good organization. I understand that the Curtiss Co. is the only plant in America which attempts still to build very big machines, machines of the Caproni type. I thought it would not be very pleasant for Mr. Caproni to give away not only his drawings, because the drawings are given to the American Government, but to give our personal technical assistance to a company which will certainly be in peace times a competitor. So I said to Mr. Potter if it was possible to please give the contract to somebody else. Just the same they gave it to a plant which I consider our competitor, and they are to teach them to make big war machines, which, prior to that time, they had not been able to produce. They made big machines, but not for war. I say that only as the representative of the inventor. I said that if they could take into consideration the inventor who has given all for nothing, that should be done. Mr. Caproni has taken nothing for his patents, and for that reason his desires should be taken into consideration. So I said if it was possible, to give these machines to somebody else. I did not care who else, but I said that if they thought it was absolutely necessary to give them to Curtiss in order to get production, to give them to Curtiss, but that I preferred somebody else, for business reasons.

Senator REED. What did you finally conclude about that?

Capt. D'ANNUNZIO. Then I went to the Curtiss plant. I saw the organization with my own eyes, and of course that organization is not to be compared with that of the Fisher Body Co. It is far and away below what I have seen. As to workmanship, the finishing of the wings, and the work in general, I must say that the product of the Fisher Body Co. is much better and safer. As I said to Mr.

Kellogg, the plant is wonderful. I think it is the biggest and best-equipped plant I have ever seen.

Senator REED. You think it is better than the Fisher Body Co.?

Capt. D'ANNUNZIO. As to equipment for aviation, I think it is better equipped. I mean that if the plant were run in a satisfactory manner it would be a plant capable of producing right away an enormous number of machines. That is my impression. It is a wonderful plant. I would like to have it in Italy. However, I do not like the way they do the work.

The CHAIRMAN. The main equipment of the plant is good, but the organization is not good.

Capt. D'ANNUNZIO. Yes, sir; and also the workmanship does not seem to be very good. I think the efficiency of the Fisher Body Co. is superior without having all the big equipment that I found there.

Senator FRELINGHUYSEN. How about the Standard plant in comparison with those?

Capt. D'ANNUNZIO. Well, the Standard plant is, of course, a smaller plant, much smaller, and not to be compared with the Curtiss plant. They have shown very much good will in the Standard. I think I could make Capronis there. I was always of the opinion that it would be a good idea to give them an order for Capronis right away. See what is happening now. The Standard plant made translations of the drawings and also corrections of some drawings which were, of course, wrong, or to be modified according to the new engines. Now, those drawings have been sent in part to the Fisher Body Co., but the method of production in the Fisher Body Co. is not the same as in the Standard. I have understood that the Fisher Body Co. is working at the drawings of the Standard in order to go into production. If that goes on, and the Curtiss Co. also makes new drawings, we will never get into production. Each manufacturer makes drawings as he likes them. The Standard Co. makes them and finds they are all right; they bring them to the Fisher Body Co., and they change them. For my workmen I must work them out in another way. Then the drawing, instead of getting into production, goes into the drafting room, and they begin again. Therefore, I say give a small order to the Standard, because I do not consider now that the Standard is at the moment ready for a big order. Give a small order to the Standard, for 200 or 300 machines, so that we will have them ready two months ahead of the others, and use the machines for training pilots and for experimental bombing. Then we will have all the machines and have pilots, and we can go ahead with all branches of the organization.

Senator REED. What did they do?

Capt. D'ANNUNZIO. They always said it was a small plant and especially full of work.

Senator REED. Who said that?

Capt. D'ANNUNZIO. Mr. Kellogg.

Senator REED. Did you have a talk with Mr. Deeds about that?

Capt. D'ANNUNZIO. No, sir. After the decision at the meeting I did not see him.

Senator REED. You urged Mr. Kellogg to give to the Standard Co. an order for the manufacture of two or three hundred machines saying to him that they could be gotten out by the Standard Co. a good

deal quicker than by the other plants, because the Standard had already translated the drawings?

Capt. D'ANNUNZIO. Yes, sir; according to its own methods of business.

Senator REED. And that these machines were necessary to be produced in advance of the general great production that was to follow, in order that in these machines made in the Standard plant you could train men who would afterwards be employed on a larger number of machines?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. And Mr. Kellogg declined to do that?

Capt. D'ANNUNZIO. He said that the Standard was full of orders and could not make more than it was doing; that it was doing a lot of work for the Navy and was making De Havilands, and so on, and that it was no use to distribute so much of the work, because it was not a good rule for production. I agreed with him, but I said that it was something special, that we must have as quickly as possible a machine for training purposes, and that we must not wait for big production.

Senator FRELINGHUYSEN. You believed, then, because the Standard plant had the drawings, that they could make the planes two months sooner than the Fisher Body Co. or the Curtiss Co., which would have to change the plans to suit their organization?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Did they not afterwards give some of those plans to the Curtiss plant?

Capt. D'ANNUNZIO. They have got the drawings, a set of about 420 drawings. They have been sent to the Curtiss people. They were sent without asking me anything about it.

Senator REED. Without asking your permission?

Capt. D'ANNUNZIO. I was not asked to give permission. I said that I wanted them to consider Mr. Caproni, to consider what he would think about it. I said, "He gives you what you have for nothing." It was only a request; it was not a demand, but they did not seem to consider it.

The CHAIRMAN. The Curtiss people told us they had an order for 500 Capronis. They were asking the Fisher Body Co. for their drawings.

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. How long since you saw the Standard plant?

Capt. D'ANNUNZIO. Last week.

Senator REED. Are they not capable of doing more work than they are doing now?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Of course, you think they can produce the Caproni?

Capt. D'ANNUNZIO. Yes, sir; but the Standard plant has too many employees. Considering the amount of work they are doing, they have too many people.

Senator REED. They say they are waiting for orders; that they have been holding their force together.

Capt. D'ANNUNZIO. That is all right, then.

Senator REED. I want to ask you about another type of machine. You have another type of machine in Italy that you use?

Capt. D'ANNUNZIO. We have several types of small machines, and three types of French machine. There are the Spad, the Hanriot, and the Nieuport.

Senator REED. Is that Italian or French?

Capt. D'ANNUNZIO. French. Then we use several types of Italian machines line the S. P. A., which I consider technically one of the best machines for fighting.

Senator REED. Is that a single-seater machine?

Capt. D'ANNUNZIO. A single seater.

Senator REED. What is the speed?

Capt. D'ANNUNZIO. One hundred and thirty-eight miles per hour.

Senator REED. What engine?

Capt. D'ANNUNZIO. The S. P. A.

Senator REED. Is that an Italian or French machine?

Capt. D'ANNUNZIO. Italian.

Senator REED. Do you use the Spad machine, also?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. That is a French machine?

Capt. D'ANNUNZIO. Yes, sir; with the Hispano-Suiza engine.

Senator REED. Is that a good machine?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Do you regard that as next to this Italian machine?

Capt. D'ANNUNZIO. The Italian machine is quicker and safer because it has a very big range of speed. The minimum speed is very low. The minimum speed is close to 35 miles an hour. The difficulty in all speed machines is the landing. The students are killed very quickly. The S. V. A. machine has very great speed, but also a low minimum speed. Therefore it is a wonderful machine.

Senator REED. What engine is used in that?

Capt. D'ANNUNZIO. The S. P. A.

Senator REED. Are those engines produced in such quantities that we could have gotten them in this country?

Capt. D'ANNUNZIO. From Italy?

Senator REED. Yes.

Capt. D'ANNUNZIO. I do not think so.

Senator REED. Was there any chance to have that particular engine produced here in a short time?

Capt. D'ANNUNZIO. I think so.

Senator REED. Was there any offer?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Who came over and offered it?

Capt. D'ANNUNZIO. An attempt was made to propose to build Italian engines, I think, by our military mission and by the representative of the S. P. A. Co., who, I think, was Mr. Dockendorf. I think he is a banker.

Senator REED. Do you know what encouragement or discouragement they met with in the attempt to introduce these Italian machines?

Capt. D'ANNUNZIO. The machine was offered just as a sample like the other machines we have in the United States. It was not a special offer. I know that some special steps were made to build the engine.

Senator REED. Do you know who could tell about that?

Capt. D'ANNUNZIO. About the engine?

Senator REED. Yes.

Capt. D'ANNUNZIO. Lieut. Testoni.

Senator REED. Next to this S. V. A. machine, which you regard as the best single fighter, there is the Spad. Do you think that is next?

Capt. D'ANNUNZIO. The Spad machine is a very good machine.

Senator REED. The Spad machine with the Hispano-Suiza motor, you think is probably next to the S. V. A.?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Now, you said that there was another machine.

Capt. D'ANNUNZIO. The Moraine-Saulnier parasol. It is a fast single seater. One sample is here.

Senator REED. Is that a monoplane?

Capt. D'ANNUNZIO. Yes, sir.

Senator REED. Has that been tested out thoroughly on the battle front?

Capt. D'ANNUNZIO. I think it is quite a new machine. It was already used on the battle front but I don't know with what results. The Spad has been used two years.

(Whereupon the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JUNE 21, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Long Island City.

The subcommittee met at the offices of the Lewis-Vought Corporation, Long Island City, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. W. F. BENNETT.

Senator REED. Please state your name and tell us where you live?

Mr. BENNETT. W. F. Bennett. I live in Brooklyn city.

Senator REED. What is the name of this factory?

Mr. BENNETT. The name of the company is the Lewis-Vought Corporation.

Senator REED. Do you know what its capital stock is?

Mr. BENNETT. \$40,000.

Senator REED. How long have you been in existence?

Mr. BENNETT. Since June 14, 1917.

Senator REED. Who principally controls that stock?

Mr. BENNETT. Mr. C. M. Vought.

Senator REED. What is your connection?

Mr. BENNETT. Treasurer.

Senator REED. How long have you been connected with the company?

Mr. BENNETT. Since June 14, 1917.

Senator REED. Did you have previous experience in air-plane manufacture?

Mr. BENNETT. I did not.

Senator REED. Did you have any in any kind of manufacture?

Mr. BENNETT. Building construction.

Senator REED. Have you had considerable experience in that work?

Mr. BENNETT. Seventeen years.

Senator REED. What was Mr. Vought's business before he organized the factory.

Mr. BENNETT. Aeronautical engineer.

Senator REED. How much experience?

Mr. BENNETT. Since 1911.

Senator REED. Is there any other man connected with the factory who has had similar experience?

Mr. BENNETT. Maj. Lewis is the Lewis of Lewis & Vought. He was a flyer on Gen. Pershing's staff.

Senator REED. A flyer?

Mr. BENNETT. A flyer.

Senator REED. He was a flyer?

Senator REED. Is he still on Gen. Pershing's staff?

Mr. BENNETT. He is dead. He died in Europe.

Senator REED. Since the war?

Mr. BENNETT. Yes, sir.

Senator REED. He was a flyer?

Mr. BENNETT. Yes, sir.

Senator REED. Was Voight a flyer?

Mr. BENNETT. Yes, sir.

Senator REED. Had he had considerable experience?

Mr. BENNETT. I could not say. He was an instructor.

Senator REED. When did he first begin the construction of airplanes?

Mr. BENNETT. He built other machines that held records. He built the Curtiss flying boat, the boat that won the Curtiss trophy. He built the machine that made the American altitude record at Hempstead, in 1916.

Senator REED. Who did he build that for?

Mr. BENNETT. For the Wright-Martin Co.

Senator REED. Had he been an engineer in the Curtiss plant?

Mr. BENNETT. I believe so.

Senator REED. Had he been connected with the Wright-Martin Co.?

Mr. BENNETT. I believe so.

Senator REED. What is the Vought machine?

Mr. BENNETT. It is a two-seated biplane used for experimental work.

Senator REED. Was it successful in the test?

Mr. BENNETT. Most successful.

Senator REED. You say you have a capital stock of \$40,000?

Mr. BENNETT. Yes, sir.

Senator REED. How many employees have you?

Mr. BENNETT. Thirty-five.

Senator REED. You have a small factory where everything is turned out by hand and you are making experimental machines? Is that right?

Mr. BENNETT. Yes.

Senator REED. What machine are you now making for the Government?

Mr. BENNETT. It is called the graduated training biplane.

Senator REED. Is there any other name?

Mr. BENNETT. The V. E.-7.

Senator REED. A two-seated plane?

Mr. BENNETT. Yes, sir.

Senator REED. What kind of a motor?

Mr. BENNETT. The Hispano-Suiza 150-horsepower.

Senator REED. What is the spread of the wings?

Mr. BENNETT. Thirty-four feet.

Senator REED. What is the speed the machine is to make?

Mr. BENNETT. In the test in March, 1918, it attained a speed of 110 miles an hour.

Senator REED. The Hispano-Suiza motor is of what power?

Mr. BENNETT. 150-horsepower.

Senator REED. What are the particular excellencies claimed for this machine?

Mr. BENNETT. It is very fast for a training machine when you take into consideration the Curtiss machines only make 91 miles. It has climbed 10,000 feet in 11 minutes and 15 seconds.

Senator REED. Where did it make that climb?

Mr. BENNETT. Dayton, Ohio, March, 1915.

Senator REED. What other excellencies do you claim for the machine?

Mr. BENNETT. Simplicity of construction.

Senator REED. Why is it more simple; can you explain that?

Mr. BENNETT. I could not go into that detail.

Senator REED. What is the cost of this machine?

Mr. BENNETT. I can not answer that question.

The CHAIRMAN. You can state what the Government is to pay for the six machines that you are manufacturing.

Mr. BENNETT. The contract calls for six units.

The CHAIRMAN. Six machines?

Mr. BENNETT. Yes, sir.

The CHAIRMAN. What are you getting for them?

Mr. BENNETT. \$59,200.

The CHAIRMAN. For the six machines?

Mr. BENNETT. Yes, sir.

The CHAIRMAN. You are not doing that on a cost-plus basis?

Mr. BENNETT. It is a flat-contract basis.

The CHAIRMAN. How many of those machines of this character does the Government propose to make?

Mr. BENNETT. One thousand six hundred. That is hearsay.

The CHAIRMAN. Do you know who is to have that work?

Mr. BENNETT. I do not.

The CHAIRMAN. Has there been any arrangement made by your company?

Mr. BENNETT. Absolutely not.

The CHAIRMAN. Do you expect to make some machines?

Mr. BENNETT. We do.

The CHAIRMAN. Why do you think so?

Mr. BENNETT. It is hearsay. I understood from Mr. Vought that we would make some of those machines.

The CHAIRMAN. Do you know how many?

Mr. BENNETT. I do not know.

The CHAIRMAN. Have you made arrangements to produce in quantities?

Mr. BENNETT. We have looked over three different buildings.

The CHAIRMAN. Are you making arrangements for getting them?

Mr. BENNETT. Not at present.

The CHAIRMAN. Why not?

Mr. BENNETT. Because we do not know what is going to happen.

The CHAIRMAN. I am asking whether you are looking ahead, trying to get in shape?

Mr. BENNETT. Yes, sir.

The CHAIRMAN. You can not tell how many machines you will get to manufacture, and you can not tell, therefore, what sized plant you ought to have?

Mr. BENNETT. Absolutely.

Senator FRELINGHUYSEN. Doesn't that depend upon the final tests?

Mr. BENNETT. As far as I am informed, the machine has been recommended and accepted as a standard training machine for the country.

Senator FRELINGHUYSEN. Why are they testing it further?

Mr. BENNETT. It is the standard test.

Senator REED. Where is Mr. Vought to-day?

Mr. BENNETT. Dayton, Ohio.

Senator REED. You are the head employee of the plant?

Mr. BENNETT. Yes, sir.

Senator REED. And the best-informed man here?

Mr. BENNETT. Yes, sir.

Senator FRELINGHUYSEN. There is a young man from the engineering department supervising construction.

Senator REED. This machine you regard as fully tested, although you are making one now which is nearly completed, which will go forward for a sand test?

Mr. BENNETT. It has been fully tested as to climbing and speed. The factor of safety has not been tested.

Senator REED. How is it as to stability?

Mr. BENNETT. O. K.

Senator REED. What machine was the nearest approach to this one at the time of the test in March, 1918?

Mr. BENNETT. The Standard machine came nearest, with a percentage of 80.

Senator FRELINGHUYSEN. Where was the Curtiss?

Mr. BENNETT. Some were down as far as 40.

Senator REED. What Curtiss machine were you referring to?

Mr. BENNETT. There are four of them.

Senator REED. They are known by different names?

Mr. BENNETT. I do not know.

Senator REED. Was it the JN-4?

Mr. BENNETT. I could not say. I understand they had three with the Hispano-Suiza motors and one with the Curtiss motor.

Senator REED. And some were down as low as 40?

Mr. BENNETT. Yes, sir.

Senator REED. You rather feel that you have the best training plane?

Mr. BENNETT. Yes, sir; I feel that way.

The CHAIRMAN. You stated to me a while ago in conversation that there was no particular time set for the performance of this contract.

Mr. BENNETT. That is true.

The CHAIRMAN. You are to get the machines out as fast as you can?

Mr. BENNETT. Yes, sir.

STATEMENT OF MR. W. K. RIDER.

Senator REED. You are a representative of the Signal Corps?

Mr. RIDER. Of the production engineering department of the Signal Corps.

Senator REED. What are you by profession?

Mr. RIDER. An aeronautical and mechanical engineer.

Senator REED. How many years of experience have you had?

Mr. RIDER. Three.

Senator REED. Are you a graduate of any college?

Mr. RIDER. No, sir.

Senator REED. Where did you learn the business?

Mr. RIDER. In actual work with the Wright-Martin Corporation.

Senator REED. How long have you been engaged in this work?

Mr. RIDER. Three years.

Senator REED. How old are you now?

Mr. RIDER. Twenty.

Senator REED. What is your connection now?

Mr. RIDER. My title is aeronautical mechanical engineer, Signal Service at Large.

Senator REED. When did you assume that position?

Mr. RIDER. Last April.

Senator REED. What are you doing now—under whom do you work?

Mr. RIDER. Capt. J. W. Rowe.

Senator REED. Are you a flyer?

Mr. RIDER. No.

Senator REED. What are you doing here at this plant at the present time?

Mr. RIDER. Why, I am doing anything I can to help to get this machine to Dayton, where it is going to be drawn up. I am reporting to Capt. Rowe and to Lieut. Col. Vincent.

Senator REED. How has the work been progressing on these experimental machines?

Mr. RIDER. Very nicely, I should say.

Senator REED. What is the character of the work they are turning out?

Mr. RIDER. It is very good work for experimental work.

Senator REED. Are you capable of passing upon the capacity of these machines from your training?

Mr. RIDER. I do not know just what you mean.

Senator REED. Are you capable of passing upon the capacity of the flying machine, or do you merely pass upon the mechanical work?

Mr. RIDER. I have not seen it fly.

Senator REED. You simply pass upon the mechanical work. Are you capable of passing upon the qualities of the machine as a flier?

Mr. RIDER. When I see it fly.

Senator REED. But not from seeing it on the bench as it is being manufactured.

Mr. RIDER. No, sir.

Senator REED. You are not that kind of an engineer who claims to be able to determine in advance whether the machine will fly, judging from its lines and proportions?

Mr. RIDER. No, sir; I am not.

Senator REED. As a matter of fact, you are really here to inspect the work that is being done and to see that it is done in a thorough and workmanlike manner, and to hurry it up just as much as you can.

Mr. RIDER. That is it.

Senator FRELINGHUYSEN. You are here to develop the job?

Mr. RIDER. It has been developed.

Senator REED. You find that the work is being pushed in a satisfactory manner, do you?

Mr. RIDER. Yes, sir; very much so. When this machine goes to Dayton I am detailed by Capt. Rowe to work with the Aeroplane Engineering Department under Col. Vincent and to follow up the production drawings that are being made.

Senator REED. When you say "follow up production drawings," what do you mean?

Mr. RIDER. To become familiar with them, so that if anything comes up when they come back to Washington, I can explain it to them.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JUNE 21, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Farmingdale, L. I.

The subcommittee met in the offices of the Breese Aircraft Co. (Inc.), Farmingdale, L. I., Hon. Charles S. Thomas (chairman) presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF MR. GEORGE A. MORRISON.

The CHAIRMAN. You are the production manager of this company?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. The name of the company is the Breese Aircraft Co.?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. The Breese Aircraft Co. has a contract with the Government for 300 so-called Penguin planes?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. It is dated the 12th day of December, 1917. Thirty-six of the 300 were delivered up to the 31st day of May, 1918.

Mr. MORRISON. I can not answer about the date of the contract. I have never seen that.

The CHAIRMAN. Will you please state what the delivery requirements of the contract were.

Mr. MORRISON. I can not tell. I have never seen the contract.

The CHAIRMAN. You have nothing to do with it? You know nothing about the terms of the contract with regard to delivery?

Mr. MORRISON. No, sir.

The CHAIRMAN. Who would know that?

Mr. MORRISON. The engineer.

The CHAIRMAN. Have you had any trouble here in regard to production?

Mr. MORRISON. Our trouble recently has been the engines.

The CHAIRMAN. State what that trouble is.

Mr. MORRISON. We did not figure that the engines were good enough to send out.

The CHAIRMAN. What kind of engines are you using here?

Mr. MORRISON. The Lawrance motor, made by the Excelsior Manufacturing Co., of Chicago.

The CHAIRMAN. They are furnished by the Government?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. What, if anything, has been the trouble with those engines?

Mr. MORRISON. I might say, Senator, most everything. One engine has one thing the matter with it, and another has another thing wrong with it.

The CHAIRMAN. Can you give in detail the defects which you found?

Mr. MORRISON. Might I read a copy of this letter to you?

The CHAIRMAN. Yes.

Mr. MORRISON. Our main letters of complaint you will find in the New York office. The president of the company addressed them to the Signal Corps.

The CHAIRMAN. What is the address of the New York office?

Mr. MORRISON. 527 Fifth Avenue, corner of Forty-fourth. The president is John Maynard Harlan. I think his residence is Chicago, Ill.

The CHAIRMAN. You have handed me a statement bearing the heading "Lawrence Motor, Made by the Excelsior Co.," and it refers to defects in twelve motors, the numbers of which are given in this statement, each showing different defects. Can you furnish the committee with a copy of that statement?

Mr. MORRISON. Yes, sir.

BREESE AIRCRAFT COMPANY (INC.),

June 24, 1918.

Senator C. S. THOMAS,

249 Senate Office Building. Washington, D. C.

DEAR SIR: Agreeably to your request and in keeping with the promise of our production manager, Mr. Morrison, we herewith inclose copies of correspondence which we have had or which has come to our knowledge regarding the Lawrence Motors, which have been manufactured by the Excelsior Motor Manufacturing & Supply Co. for the Government and by it furnished to us for installation in the Penguins which we are making for the Government. It was not possible to send this to you Saturday as had been intended.

The writer regrets that he was at the company's New York office when you visited the factory. Had he known that you were intending to visit the factory he would have arranged matters requiring his attention at the New York office, so as to have enabled him to be at the factory and have the pleasure of receiving you.

Any further information which you may desire regarding the Breese Aircraft Co., its contracts with the Government, and its operations toward fulfilling these contracts will be cheerfully and promptly furnished.

Respectfully, yours,

BREESE AIRCRAFT COMPANY (INC.).

By JNO. MAYNARD HARLAN.

President.

BREESE AIRCRAFT COMPANY (INC.),

Farmingdale, April 19, 1918.

EXCELSIOR MOTOR MANUFACTURING & SUPPLY CO.,

3701 Cortland Street, Chicago, Ill.

GENTLEMEN: We are returning to you by express one defective hub which came to us on one of your Lawrence Excelsior motors, the number of the motor being 40110.

Please credit us for same.

Respectfully, yours,

BREESE AIRCRAFT CO. (INC.).

FARMINGDALE, L. I., April 29, 1918.

EXCELSIOR MOTOR Co., Chicago, Ill.:

We shipped to you on Monday two (2) defective motors, and are shipping to-day two (2) defective hubs. We would kindly request that you send us by express two perfect ones in place.

Yours, very truly,

BREESE AIRCRAFT Co. (INC.).

FARMINGDALE, L. I., May 2, 1918.

Mr. JOHN M. HARLAN, New York City, N. Y.

MY DEAR MR. HARLAN: We have received to date from Excelsior Motor Co., of Chicago, Ill., 36 motors, numbers of which are: 38508 which was installed into experimental machines; 40110 to 40144 are or will be used for shipment, except 40111 and 40116, returned to the Excelsior Motor Co. as defective. Defective hubs were also returned on 40110, 40135, 40133, and 40117. Carbureter union was missing and cap for needle valve. On all motors up to 40119 the butterfly and choke had to be taken off and reversed, which required an average of two hours' labor. From 40119 to 40114 we find that the butterfly is correct but that the choke still has to be reversed, which requires from 20 to 30 minutes' labor for the change.

Trusting this is the information you require, I remain,

BREESE AIRCRAFT Co., (INC.).

Per G. A. MORRISON.

BREESE AIRCRAFT Co. (INC.).

Farmingdale, L. I., May 7, 1918.

EXCELSIOR MOTOR MANUFACTURING & SUPPLY Co.,

New York, N. Y.

GENTLEMEN: We beg to call your attention again to the workmanship on the Lawrance motors being supplied by the Signal Corps for the Breese Penguin.

We are shipping back to you to-day two (2) more hubs which we are unable to fit to propellers, owing to the fact that the bolt holes are all out of line. It would seem that this would be a more or less simple matter to obviate, as it is perfectly apparent without examining the hubs closely.

We also find that the keyways on the shafts are very badly cut, and in some instances they have been made too large and then soft metal hammered in to bring them down to size. After running the motor for only a few minutes installation test they work loose, as there is nothing to hold them but a small machine screw.

The writer feels it would be to your advantage to look into these things a little more closely before the motors are shipped, as they will undoubtedly cause trouble when they have been on the field a very short time.

Very truly, yours,

LOUIS MONTANT,

Vice President and General Manager.

FARMINGDALE, N. Y., May 8, 1918.

From: Breese Aircraft Co. (INC.).

To: Victor M. Tyler, New York District Equipment Office, 480 Lexington Avenue, New York.

Subject: Letter to Excelsior Motor Manufacturing & Supply Co.

1. We inclose herewith copy of letter written to the Excelsior Motor Manufacturing & Supply Co., of Chicago. We trust same will meet with your approval.

BREESE AIRCRAFT Co. (INC.),

LOUIS MONTANT,

Vice President and General Manager.

FARMINGDALE, LONG ISLAND, N. Y.,
May 13, 1918.

From: Breese Aircraft Co. (Inc.).

To: District Manager of Equipment, 480 Lexington Ave., New York City.

Subject: Defective motors.

1. We beg to report that owing to a loose crankshaft, we have been forced to take out Motor No. 40145 in Penguin No. 33484 after less than one minute of running, this being the third motor which we have had to return on account of loose crankshaft.

2. We inclose copy of our letter of May 7 to the Excelsior Motor Manufacturing and Supply Co., on this subject.

3. We must again protest against the obvious defects in these motors, and request that they be sent to us in proper running condition as we desire to deliver only machines in perfect running condition.

4. In future, unless ordered by the Signal Corps to the contrary, this company will not install any motors which on inspection show evidences of defects that might develop seriously after a short run. This refers particularly to badly fitted propeller hub keys and loose crankshaft.

BREESE AIRCRAFT CO. (INC.),
S. S. BREESE, *Chief Engineer.*

FARMINGDALE, LONG ISLAND, N. Y.,
May 13, 1918.

Statement by G. E. Morrison, John Beck, Charles Keller, Mr. Sidney Breese.
Motor 40145.

This motor ran for about 10 seconds, or just practically turned over, and found it knocked very hard, and it was decided that by continuous running it would last about five minutes. Mr. Breese also saw the condition of this motor. The oil chamber was full of oil at the time.

G. ELLIOT MORRISON.
JOHN BECK.
CHARLES KELLER.

FARMINGDALE, LONG ISLAND, N. Y.,
May 13, 1918.

From: Breese Aircraft Co. (Inc.)

To: Mr. Victor Taylor, officer in charge of engineering, production, and inspection departments of the equipment division, New York district.

Subject: Defective workmanship in Lawrance motors.

1. The Lawrance motors being furnished to us by the Government for use in the Breese Penguins under contract No. 2365, order 20315, show very defective workmanship in manufacture.

2. Letters written by us directly to the manufacturer, the Excelsior Motor Manufacturing & Supply Co., of Chicago, calling to its attention such defects, have failed thus far to secure proper workmanship in the motors.

3. The 44 motors thus far received by us show the following obvious examples of defective workmanship:

(a) Motors Nos. 40111 and 40116 being so defective that they could not possibly be remedied by us, were returned by express to the manufacturer.

(b) Defective hubs intended for motors 40110 and 40135 and 40117 were returned by express to the manufacturer to be replaced by proper hubs; there were also missing a carburetor union and a cap for needle valve.

(c) On all motors up to 40119, the butterfly and choke had to be removed and reversed. That operation required an average of two hours labor.

(d) On the motors numbered 40119 to 40144 the choke had to be reversed; an operation requiring from 20 to 30 minutes labor.

(e) May 7 we returned by express to the manufacturer two hubs, it being impossible to fit them to propellers because of the fact that the bolt holes were out of line. The discrepancy in the alignment was apparent upon even a casual view.

(f) As late as May 13 motor No. 40145 recently received had to be returned by express to the manufacturer because of loose thrust bearing and defective hub. At the same time there were also returned four defective hubs from motors Nos. 40131 and 40138, 40143 and 40150. Two carburetor unions are missing and nipples are also lacking on two other motors.

(g) The keyways on the shaft are cut in an unworkmanlike manner. In some cases they having been cut too large, soft metal had been hammered in to reduce them to the proper size. A brief running of the motor upon installation test makes the keys work loose so that all that holds them is a small machine screw.

4. It is earnestly requested that as soon as may be you take such steps as you may deem proper to the end that the motors still to be furnished us by the Government be constructed in a workmanlike manner and delivered to us in such condition as to permit immediate installation and successful use.

BREESE AIRCRAFT Co. (INC.),
JOHN MAYNARD HARLAN,
President.

FARMINGDALE, L. I., N. Y.
June 25, 1918.

Senator C. S. THOMAS,
249 Senate Office Building,
Washington, D. C.

DEAR SIR: Through inadvertence, we omitted to inclose to you yesterday copies of our letter to Capt. E. B. Lausier, district manager of finance, New York City, dated May 23, and copy of his reply of May 29, 1918, which we herewith hand to you.

Very truly, yours,

BREESE AIRCRAFT Co. (INC.),
J. M. HARLAN,
President.

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
EQUIPMENT DIVISION, FINANCE DEPARTMENT,
New York, N. Y., May 29, 1918.

From: District manager, finance.

To: Breese Aircraft Corporation, 527 Fifth Avenue, New York.

Subject: Defective workmanship in Lawrance motors furnished by the Government.

1. Delayed acknowledgment is hereby made, to your letter of 23d instant, with contents fully noted.

2. The information therein contained is of value to us. We thank you for calling same to our attention, and are passing same along to Maj. Frank E. Smith, commanding officer, Approvals Section, Washington, D. C., for his further information and files.

E. B. LAUSIER,
Captain A. S., Sig. R. C., District Manager, Finance.

FARMINGDALE, LONG ISLAND, N. Y.,
May 23, 1918.

From: Breese Aircraft Co. (Inc.), John Maynard Harlan, President, 527 Fifth Avenue, New York.

To: Capt. E. B. Lausier, District Manager of Finance, New York City.

Subject: Defective workmanship of Lawrance motors furnished by the Government.

1. We understand from you that you desire such information as is given below because of its possible bearing upon the Government's rights under its contract for the manufacture of the Lawrance motors.

2. We have just returned by express to the Excelsior Motor Manufacturing & Supply Co. defective hubs from motors Nos. 40155, 40156, 40157, 40162, 40165, 40166, 40167, 40172, 40158.

3. Whether in other respects the motors for which these hubs were intended are defective we are unable at this writing to state.

BREESE AIRCRAFT Co. (INC.),
JOHN MAYNARD HARLAN, *President.*

FARMINGDALE, LONG ISLAND, N. Y.,
May 15, 1918.

From: Breese Aircraft Co. (Inc.), John Maynard Harlan, President.
To: Capt. E. B. Lausier, District Manager of Finance.
Subject: Defective workmanship in Lawrance motors furnished by the Government.

1. Being in some doubt as to whether information of the nature contained in our letter of May 13 to Mr. Victor Tyler, district manager of engineering, production and inspection, should be communicated to you because of its possible bearing upon the Government's rights under its contract for the manufacture of Lawrance motors, a copy of that letter is herewith inclosed out of abundant caution.

2. If such information is not desired by the Finance Department, will you kindly advise the writer so that in the future we may not again burden you with information having no relation to the particular functions and business of your department.

BREESE AIRCRAFT CO. (INC.),
JOHN MAYNARD HARLAN, *President.*

WAR DEPARTMENT,
EQUIPMENT DIVISION, FINANCE DEPARTMENT,
New York, N. Y., May 17, 1918.

From: District Manager of Finance.
To: Breese Aircraft Co. (Inc.), Farmingdale, Long Island.
Subject: Defective workmanship in Lawrance motors furnished by Government.

1. Acknowledgment is hereby made of your letter of the 15th instant, with stated inclosures and contents fully noted.

2. The information therein contained is of value to us, and we appreciate your calling same to our attention.

3. We are placing this information before the proper authorities in Washington, D. C., who will hold same confidential, with their further investigation and report, with which we trust to acquaint you in due course of receipt.

E. B. LAUSIER,
Captain, A. S. Sig., R. C.,
District Manager Finance.

WAR DEPARTMENT, EQUIPMENT DIVISION,
SIGNAL CORPS, UNITED STATES ARMY.
Farmingdale, N. Y., May 16, 1918.

From: District Manager of Equipment, New York City.
To: Breese Aircraft Co. (Inc.), 527 Fifth Avenue, New York; attention J. M. Harlan.
Subject: Defective workmanship in Lawrence motors manufactured by Excelsior Co.

1. Answering your letter of May 13. This matter has been forwarded to the Chicago office for special attention.

VICTOR TYLER,
District Manager of Equipment.

DISTRICT MANAGER OF EQUIPMENT,
NEW YORK DISTRICT EQUIPMENT OFFICE,
New York.

From: Breese Aircraft Co. (Inc.).
To: Excelsior Motor Manufacturing & Supply Co.
Subject: Defective hubs.

1. We are returning to you by Adams Express hubs from the following motors, as it is impossible to properly mount a propeller on any one of them: Motors Nos. 40152, 40154, 40155, 40156, 40157, 40158, 40163, 40165, 40166, 40167, 40172.

2. We are sending a copy of this letter to the district manager of equipment, New York district, having previously reported all but three of the above numbers to that office.

BREESE AIRCRAFT CO. (INC.),

Chief Engineer.

Lieut. F. J. MAYNES,
District Manager of Equipment.

Motor.

40171. Cylinder head cracked, bolts drawn up too tight, cotter pins missing, peen marks on casting around guides, key in crank shaft loose, rocker arms on exhaust valves loose, wide play.
40157. Bolts in cylinder head drawn down too tight, pulling head out of shape, cotter pins missing, peen marks on casting around tappet guides; also around oil pump.
40173. Rocker arms very bad fit, also bearing and yoke on push rods, cotter pins missing, tappets turn when cam comes up, showing cam does not fit squarely on bottom of tappet.
40162. Peen marks on castings around tappet guides, cotter pins missing.
40163. Nearly all other cotter pins missing, key loose in crank shaft, two nuts missing off timing gear cover, oil leaks very bad, rocker arm fits very poorly, peen marks around tappet guides.
40172. Cylinder head leaks, lock nut on cylinder head belt thread stripped, bolt center punched to hold nut on, one cylinder head bolt nut missing, no cotter pins on oil pump and connections, rocker arms fit poorly, oil leaks out of timing gear cover in a stream, casting cracked around cam-shaft-bearing housing, other cracks in casting peened over, drain cock in all chambers missing, defective gasket on oil pump.
40166. Casting cracked and peened over, also badly marked with hammer and vice marks, rocker arms fit very poorly.
40168. No oil plug in oil pump, cotter pins missing.
40142. Defective gasket on oil pump, cylinder head leaks.
40167. Leaky piston, combustion chamber fills up with oil.
40144. Cylinder head leaks quite badly, evidently no gasket.
40161. Cylinder head leaks quite badly, evidently no gasket.

Push rods are not set up on any of the motors received, plugs on each side of casting leak oil.

All these motors have PP stamps on casting, and also either rejection or accepted stamps.

FARMINGDALE, LONG ISLAND,
May 16, 1918.

From Breese Aircraft Co. (Inc.).

To: District manager of equipment, New York district office, 480 Lexington Avenue, New York.

Subject: Defective hubs.

1. This company begs to call your attention to the fact that out of the last 18 motors from the Excelsior Motor Co. nine had propeller hubs which are unfit for use. The motor numbers on which these hubs came are motor Nos. 50155, 50157, 40165, 40167, 40172, 40156, 40156, 40162.

2. Inclosed sketch shows the defect found in all the hubs in greater or less degree, and shows clearly why a propeller can not be properly mounted.

BREESSE AIRCRAFT Co. (INC.),
S. S. BREESSE, *Chief Engineer.*

WAR DEPARTMENT, EQUIPMENT DIVISION,
SIGNAL CORPS, UNITED STATES ARMY,
May 16, 1918.

From: District manager of equipment, New York City.

To: Mr. P. M. Benedict, district manager of equipment, 814 Consumers Building, Chicago, Ill.

Subject: Defective workmanship in Lawrance motors manufactured by Excelsior Co.

1. Attention is directed to the attached copy of letter from the Breese Aircraft Co.

2. Anything that can be done to improve the character of these engines will be greatly appreciated. The matter has been up several times before.

VICTOR TYLER,
District Manager of Equipment.

[First Indorsement.]

CHICAGO DISTRICT EQUIPMENT OFFICE.

May 21, 1918.

To New York district equipment office.

1. The complaints from Breese Aircraft Co. on Lawrence engines manufactured by the Excelsior Motor Manufacturing & Supply Co. may be classified as follows:

(a) Two complete engines, No. 40111 and No. 40116, returned because of unexplained defects.

(b) Incorrect assembly of carburetors and their parts.

(c) Defective propeller hubs.

(d) Poorly milled propeller hub keyways in the crank-shaft tapers.

2. This office wishes to report as follows on the defects mentioned above:

(a) Engine No. 40111 unquestionably had been run without sufficient lubrication, causing bearings to burn out and cylinder to become scored and pistons to seize. Evidently this condition was known before the engine was returned to Chicago, because combustion chamber had been entirely filled with clean lubricating oil, as an inspection by representatives of this office revealed.

(a1) Engine 40116 was put on test by United States Signal Corps inspectors immediately upon its receipt at the Excelsior Motor Manufacturing & Supply Co. and found to be in perfect running condition.

It is understood by this office that complaint on this engine was that the engine had excessive end play. Inspectors proved that the end play was less than specifications called for.

(b) It would appear that specifications or blue prints must call for the butterfly and choke to be in a different position than that required by the installation of the engine in the Breese Penguin. As soon as information concerning the location required was received, the necessary changes were made and all engines shipped since that time have had choke and butterfly reversed.

(b1) The fittings which were missing on four carburetors were removed during a test of the engine, which removal is regular practice. This point will be watched very closely to see that they are replaced on each carburetor before shipment.

(c) The nonalignment of bolt holes in propeller hubs was caused by the lack of proper drill jig. This is being supplied and every hub will be tested on the engine with which it is shipped, eliminating further trouble from this source.

(d) The cutting of keyways will be given very careful attention and all keyways will be correctly fitted in the shaft.

3. Production on Lawrence engines has been held up for a short time and is being resumed this date. This office is taking very definite steps to cover inspection of parts manufactured and assembly of this engine in such a way that any further cause of complaint will be entirely eliminated.

By authority of the District Manager of Equipment:

O. M. BABCOCK.

Mechanical Department.

NOTE.—Motor No. 40116 referred to in subparagraph (a1) was examined again in Chicago by Senior Inspector Morgan from the New York District and our complaint was found to be correct.

BREESE AIRCRAFT Co. (INC.).

FARMINGDALE, LONG ISLAND, N. Y., May 13, 1918.

EXCELSIOR MOTOR MANUFACTURING AND SUPPLY Co.,

Chicago, Ill.

GENTLEMEN: We are returning to you by express to-night motor No. 20145 with a loose thrust bearing; also a defective hub. We are also returning in the same case four defective hubs from motors Nos. 40131, 40138, 40143, 40150.

Two carburetor gas-line unions are missing; also we are short the nipples on two other motors.

Yours, very truly,

BREESE AIRCRAFT Co. (INC.),

G. A. MORRISON,

General Superintendent.

FARMINGDALE, LONG ISLAND, N. Y.,
May 17, 1918.

EXCELSIOR MOTOR MANUFACTURING AND SUPPLY Co.,
Chicago, Ill.

GENTLEMEN: We are sending you by express to-day defective hubs taken from motors Nos. 40155, 40157, 40165, 40166, 40167, 40172, 40158, 40156, 40162. Please send us replacements at once.

Yours, truly,

BREESE AIRCRAFT Co., (INC.).
G. A. MORRISON.

BREESE AIRCRAFT Co. (INC.),
CONTRACTORS TO UNITED STATES GOVERNMENT.
Farmingdale, N. Y., May 17, 1918.

Statement of motor No. 40111. This motor, on being installed in the fuselage in final assembly, and after the propeller was put on, it was turned over by the foreman, and he remarked to the men who have signed below of the peculiar noise that it made, and his opinion was that it sounded like a broken piston ring.

This was prior to any trial by power.

Lubricating oil was put in this motor by Morrison and Beck until the oil ran out of the pet cock.

On testing this motor, it ran less than one-half minute, when it stopped.

No further test being made, as it was decided to return this motor as defective.

Above statement correct.

G. ELLIOTT MORRISON.
JOHN BECK.
CHARLES KELLER.
A. WILSON.

FARMINGDALE, LONG ISLAND, N. Y., May 20, 1918.

BREESE AIRCRAFT Co. (INC.),
Farmingdale, Long Island, N. Y.

GENTLEMEN: Yours of May 13 arrived last week, but up to the present time we have not received motor No. 40145 and the defective hubs you mention.

Upon receipt, we shall examine carefully and advise you accordingly.

We do not exactly understand what you mean by gas-line unions, but are mailing you, under separate cover, two unions which may answer your requirements.

Please bear in mind that they are the only parts that we furnish in connection with the carburetor.

We are unable to determine what you mean or require in the way of nipples. Suggest that you refer to blue print and give us part number, if possible, and if you can not locate part number send us sample and we will endeavor to forward without delay.

We will be unable to ship you any hubs for at least 10 days, the delay being entirely due to the hold-up or cancellation of motor contract, which was only reinstated to-day.

As soon as we resume manufacturing and accumulate a few hubs will make you a shipment of four to replace those you are returning, naturally assuming that they are defective, as you state. In the meanwhile hope that you will accept our assurance that we greatly regret that you have been subjected to any annoyance. We will endeavor to be more careful in the future.

Yours, very truly,

EXCELSIOR MOTOR MANUFACTURING & SUPPLY Co.,
FRED B. MATHIS, General Manager.

CHICAGO, ILL., May 20, 1918.

BREESE AIRCRAFT CORPORATION,
Farmingdale, Long Island.

GENTLEMEN: Please pardon our seeming negligence in not promptly acknowledging yours of the 7th. The delay was entirely due to the cancellation of the Government contract, and we, therefore, thought it advisable to defer answering until we knew just where we were at.

It will probably be interesting for you to know that we just received a letter reading as follows:

"Confirming phone conversation with you to-day relative to Lawrance motors: This is your authority for proceeding with your order for completion of the motors due on same, delivery to be made at as early a date as possible, all as per original contract.

"By direction of the Chief Signal Officer of the Army.

"F. E. DERBYSHIRE."

Rest assured that we will immediately carefully go into the details you mention and do everything in our power to eliminate all possible confusion.

We hope that you will always feel at liberty to write us frankly on any similar subject that may be brought to your attention.

Yours, very truly,

EXCELSIOR MOTOR MANUFACTURING & SUPPLY Co.,
FRED B. MATHIS, *Manager*.

FARMINGDALE, LONG ISLAND, May 25, 1918.

From: J. R. Reid, through Mr. Morgan, senior inspector, Breese Aircraft Co. (Inc.).

To: District manager of equipment.

Subject: Lawrance motors.

1. It is recommended that no further shipment of Lawrance motors be made by the Excelsior Co. until the workmanship on same is brought up to the Signal Corps standard.

2. The motor is one that should be very accurately machined in order that it may develop its full power, on account of the expansion of many of its parts through the heat in operation.

3. In the opinion of the writer, based on an examination of the motors now at the plant of the Breese Aircraft Co., the Excelsior Co. has been very much at fault, in that their workmanship is of the poorest throughout the machine.

The finished surfaces are very rough, and in some cases where the specifications call for a ground finish the surfaces are so rough that it would not be possible to run them together without immediately cutting the bearings.

The Babbited bearings showed no indications of having been scraped or reamed. The oil grooves have not been rounded off, and are very rough, and when the bearing is disassembled shows chips.

The stuffing box leaked very freely on all the motors examined. The intake manifold leaked 30 per cent on all motors supplied to the Breese Aircraft Co.

The carbureters had not been adjusted on 50 per cent.

Castings showed peening marks about push-rod guides.

Cotter pins were missing on all motors examined.

The lifter-rod yoke was milled so as to allow the clevis pin to move. In some cases the pin turned completely around.

Keyways on crank shafts were very crudely cut. The keys did not fit, and were roughly ground off on the bottom at the ends so that they did not seat. The stock was in many cases peened so as to hold key temporarily, but it loosened after a few seconds' running, and was then held by the screw alone.

The propeller-hub bolts were not straight, and were badly scored by the tools. The holes in the hub and flange did not register. There was upward of one thirty-second inch clearance in the bolt holes.

The pipe end of the carbureter union was missing on some machines.

Drain cocks were missing from the pumps of some machines.

Breather tube strainer missing on some machines.

End play was greater than it should have been in many machines.

4. Motor 40164 was partly disassembled and the following defects were discovered:

The clevis pin on lifter rod was broken and was held in place by the screw in the end.

The stud holding timing gear case cover to crank case was broken off and held in place by the nut.

The cotter pins to retain nut on timing gear stud was missing.

Crank case marked "R. P. P."

Connecting rod (forked) bore screw clamp and was badly marked by hammer. Web was bent. This indicates that the rod had been straightened cold apparently.

Connecting rod bolts were scored by tools. Specification calls for ground finish. Nut had flat threads.

Ends play in cam shaft caused poor valve opening due to spiral gear being out of mesh.

Cams were not backed off. Drawing calls for one thirty-second-inch relief to allow the proper clearance for valve rocker.

No compression in one cylinder. Rings were poorly fitted and were black halfway round, showing that the gas was firing past them.

Note that this motor was selected at random from the last lot received from Excelsior.

5. It has been impossible to run any of these motors more than 20 minutes or to get the rated power from them. The Breese representative, who is now in Texas demonstrating these machines, wired to-day he could not get more than 700 revolutions per minute from the machine that he was using there.

6. This machine is not a cheap one in any sense of the word, and at the price that Excelsior is getting for them they should come through in good shape. Mr. Lawrance, the designer of the motor, was allowed \$25,000 over the cost of the machine for tools and fixtures.

7. Mr. Lawrance has one of these two-cylinder machines that is developing 36 horsepower at 1,700 revolutions per minute and has been in service for a long time. This would seem to indicate that the trouble now being found with the machine is due to the poor work of the Excelsior and not to the design of the machine.

8. None of the motors bear the Signal Corps plate or the acceptance stamp as required by Inspection Manual.

L. A. & A. E., S. S. L.

FARMINGDALE, LONG ISLAND, *May 23, 1918.*

From: Breese Aircraft Co. (Inc.), John Maynard Harlan, president, 527 Fifth Avenue, New York.

To: Mr. Victor Tyler, district manager of equipment, 480 Lexington Avenue, New York.

Subject: Defective workmanship in Lawrance motors furnished by the Government.

1. As it is now doubtless known to the engine expert sent by you to our factory, we have returned to the Excelsior Motor Manufacturing & Supply Co. defective hubs taken from motors Nos. 40155, 40156, 40157, 40162, 40165, 40166, 40167, 40172, and 40158.

2. With the exception of motors already installed and one about to be installed in finished penguins, none of the motors now at the factory have hubs.

3. We are in receipt of a letter dated May 20, 1918, from the Excelsior Motor Manufacturing & Supply Co., stating that they will be unable to ship us any hubs for at least 10 days, and further stating that the delay is entirely due to the holdup or cancellation of the motor contract, which was only reinstated to-day (May 20).

4. As you know, we have already been delayed in our production by reason of defective workmanship in motors, and we earnestly hope that you will use every effort to have the further delay in shipping hubs to us, which the Excelsior Motor Manufacturing & Supply Co. say will be "at least 10 days," shortened as much as possible by intensive effort on the part of that company.

BREESE AIRCRAFT Co. (INC.),
_____, *President.*

[New York district equipment office, Signal Corps, United States Army, 480 Lexington Avenue, New York, N. Y.]

WAR DEPARTMENT, EQUIPMENT DIVISION,
SIGNAL CORPS, UNITED STATES ARMY,
New York, May 24, 1918.

From: District manager of equipment, New York City.

To: Breese Aircraft Corporation, 527 Fifth Avenue, New York City.

Subject: Defective workmanship in Lawrance motors.

1. Mr. Harlan's letter of May 23 is received and noted.

2. For your information in regard to engine trouble, copy of correspondence with the Chicago office is attached.

VICTOR TYLER,
District Manager of Equipment.

FARMINGDALE, LONG ISLAND, *May 30, 1918.*

Mr. GEORGE A. MORRISON,

Care of Breese Aircraft Co., Farmingdale, Long Island.

DEAR MR. MORRISON: I am inclosing copy of correspondence re Lawrence motor trouble.

Yours, very truly,

JOHN MAYNARD HARLAN,
President Breese Aircraft Co. (Inc.).

FARMINGDALE, LONG ISLAND, *June 14, 1918.*

From: John Maynard Harlan, president Breese Aircraft Co. (Inc.), 527 Fifth Avenue, New York.

To: Mr. Victor M. Tyler, district manager of equipment, 480 Lexington Avenue, New York.

Subject: Copy of J. B. Reid's report regarding motor.

1. Inclosed herewith is signed copy of report dated May 25, made by J. B. Reid, to district manager of equipment, New York City, regarding Lawrence motors.

2. This copy you kindly loaned to the writer with permission to have it copied for use at the plant of the Breese Aircraft Co. in checking up Lawrence motors hereafter to be received.

BREESE AIRCRAFT CO. (INC.),
JOHN MAYNARD HARLAN, *President.*

FARMINGDALE, LONG ISLAND, *June 17, 1918.*

From: Breese Aircraft Co. (Inc.), 527 Fifth Avenue, New York.

To: Mr. Victor M. Tyler, New York district manager of equipment, 480 Lexington Avenue, New York.

Subject: Final inspection and acceptance of Penguin in case of more than 10 day's delay in furnishing motors.

1. Article VI of contract 2365 specifying the payment to be made to us by the Government provides, in paragraph (6) thereof, as follows:

"The sum of two hundred forty (\$240.00) dollars for each unit delivered and accepted, as a fixed profit, all of which shall be paid in each week. If, however, solely by reason of the failure of the Government to furnish motors in accordance with Article I hereof, the acceptance and delivery of any unit should be delayed beyond 10 days the contractor shall be paid upon final inspection and acceptance of such without motors, the sum of two hundred twenty-eight (\$228.00) dollars and the balance of the fixed profit provided in this section upon the installation by him of the motor as provided in Article I hereof, provided that if the motor is not furnished by the Government within ninety days from the acceptance and delivery of the unit, the balance of the fixed profit shall be paid."

2. In view of the above quoted provision of our contract and considering the delay which has occurred, and the further likely delay to occur, in delivering motors to us, it is requested that you instruct the Government inspector at our plant to finally inspect every penguin tendered as complete, excepting motor, and to formally accept such penguin, if found satisfactory, on behalf of the Government and issue a proper certificate to us showing such acceptance and the date thereof.

3. We now have at the factory completed, except installation of motors, about 30 penguins.

BREESE AIRCRAFT CO. (INC.),
JOHN MAYNARD HARLAN,
President.

The CHAIRMAN. Was the statement made as a result of the actual examination of different motors therein mentioned?

Mr. MORRISON. We have written a number of letters.

The CHAIRMAN. I am talking about this one.

Mr. MORRISON. We wrote a letter about that.

The CHAIRMAN. You do not seem to get my question. Are the defects set forth in this statement the result of actual examination?

Mr. MORRISON. Oh, yes, sir.

The CHAIRMAN. Did you send a copy of this document to the Signal Corps?

Mr. MORRISON. I guess that question would have to be answered by the New York office. All the correspondence with the Signal Corps goes through the New York office.

The CHAIRMAN. You make your report to the New York office, and they take up these things?

Mr. MORRISON. Yes, sir. We know that they reported it, because we heard from it, and the Excelsior Co. has a man out here now repairing these motors.

The CHAIRMAN. The motors for this penguin machine furnished by the Government are delivered here at the factory?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. And you inspect them here?

Mr. MORRISON. We receive them from the Excelsior Motor Co. with the stamp of approval of the United States Signal Corps on them. We are not supposed to do anything with the motors.

The CHAIRMAN. I understood you to say a few moments ago that this statement of defects was the result of an examination of these motors.

Mr. MORRISON. We inspected them on our own hook.

The CHAIRMAN. When these motors are received from the Government they bear the Government inspector's certificate.

Mr. MORRISON. Yes, sir.

The CHAIRMAN. And you then examine them yourselves, and when you examine them you find them defective, and so defective that you refuse to use them?

Mr. MORRISON. Yes, sir; but we could not refuse to use them.

The CHAIRMAN. You do not use them until you report the defects to this office in New York, and they take it up with the Signal Corps.

Mr. MORRISON. Yes, sir.

The CHAIRMAN. What has been the result of your reporting these defects?

Mr. MORRISON. The final result is that the Signal Corps stopped delivery.

The CHAIRMAN. Stopped the entire delivery?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. Did you find them all more or less defective, practically speaking?

Mr. MORRISON. We sent out 44 on the field that we considered in fair condition.

The CHAIRMAN. Forty-four out of how many delivered here?

Mr. MORRISON. Sixty-three.

The CHAIRMAN. That is, you found approximately two-thirds all right.

Mr. MORRISON. Yes, sir.

The CHAIRMAN. And one-third defective?

Mr. MORRISON. That is, all right as far as we could discover from the outside. We never dismantled the motors or took them apart.

The CHAIRMAN. Didn't you take them to pieces to examine them?

Mr. MORRISON. No, sir.

The CHAIRMAN. That means that defects which you have discovered are defects that are revealed when you try the engine out?

Mr. MORRISON. Yes, sir; before we try them we see them.

The CHAIRMAN. Is it something you can see with the naked eye?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. Notwithstanding the fact that they are inspected by the Government inspector at Chicago.

Mr. MORRISON. Yes, sir. Three were returned to Chicago without waiting for the Signal Corps.

The CHAIRMAN. Were you ever required to use any machine that you found defective?

Mr. MORRISON. No, sir.

The CHAIRMAN. What became of those?

Mr. MORRISON. Those out there now are defective. They are to be repaired.

The CHAIRMAN. Then some of the machines which you find defective are repaired?

Mr. MORRISON. Not machines—motors.

The CHAIRMAN. They are repaired right here at your factory by the representative of the Excelsior Manufacturing Co.?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. How many are repaired so that you can use them?

Mr. MORRISON. That I can not tell, because he has been here only two days. I would like to have you talk to that man.

The CHAIRMAN. Then this matter of repairing motors is very recent because he has only been here a couple of days?

Mr. MORRISON. That is right. We wrote letters to the Excelsior Manufacturing Co., but they never paid any attention to them.

The CHAIRMAN. That is, the letters that you wrote from here, or the letters from New York?

Mr. MORRISON. Here is a statement here [indicating].

The CHAIRMAN. Can you furnish us a copy of every report made regarding defects in motors that you have in your files?

Mr. MORRISON. I will be very glad to do so.

The CHAIRMAN. You say that your complaints to the Excelsior Manufacturing Co. brought no response and that no attention was paid to them?

Mr. MORRISON. No, sir; they paid no attention to them.

The CHAIRMAN. I think I will content myself, Mr. Morrison, with asking you to furnish us with a copy of all the correspondence you have calling attention to defects in motors. How soon can you furnish us with that?

Mr. MORRISON. I can give you that in two or three hours.

The CHAIRMAN. You can send them to-day, perhaps.

Mr. MORRISON. Yes, sir.

Senator REED. What is the horsepower of this machine?

Mr. MORRISON. Twenty-two.

Senator REED. Why is it that such an engine as the Ford can not be fitted into this machine?

Mr. BREESE. They told me at the time this machine was tried that somebody had built a Penguin with a Ford motor in it, but it was not satisfactory. It means that you have a radiator and the water-cooling system, and the first time the machine goes over that is

broken and damaged. With respect to this motor, it does not make much difference what you do.

Senator REED. What is the cost of this motor?

Mr. BREESE. We do not buy them.

Mr. MORRISON. I believe you said that the bogie price of this machine was \$1,600.

Mr. MORRISON. I believe so.

The CHAIRMAN. What is the percentage of profit which the company receives?

Mr. BREESE. Fifteen per cent on \$1,600.

The CHAIRMAN. On the bogie price?

Mr. BREESE. Yes, sir.

The CHAIRMAN. When were you to deliver these machines?

Mr. BREESE. We have no specified date.

The CHAIRMAN. At any time?

Mr. BREESE. Just as quickly as we could.

The CHAIRMAN. Without any time limit being fixed for delivery?

Mr. BREESE. I think we are supposed to have the order complete about the 1st of August or the end of August. There was no rate of delivery specified.

Mr. MORRISON. If we can get the engines we can deliver the complete order in five weeks.

Senator REED. You say the bogie price is \$1,600 and you get a percentage on that?

Mr. BREESE. The bogie profit is fixed whether the actual cost exceeds \$1,600 or not. If they cost \$1,800, we would not get 15 per cent on \$1,800.

Senator REED. Suppose they cost \$1,400?

Mr. BREESE. We get the same per cent on \$1,600 and 25 per cent of the saving. I think it is the same contract that a lot of other people have.

Senator FRELINGHUYSEN. Mr. Morrison, this company took a vacant factory and started to manufacture this Penguin machine?

Mr. MORRISON. Yes, sir.

Senator FRELINGHUYSEN. When did you receive the designs of this machine?

Mr. MORRISON. The designs of the machine did not come from the Government.

Senator FRELINGHUYSEN. Where did they come from?

Mr. MORRISON. From Mr. Breese. He is the inventor.

Mr. BREESE. We did not have a complete set of designs. We simply had a machine which was built out of my head.

Senator REED. I understand the Penguin is a type of machine used in France?

Mr. BREESE. Yes, sir.

Senator FRELINGHUYSEN. Did you copy that machine in designing this one?

Mr. BREESE. No. I have a little bit of two or three different ones.

The CHAIRMAN. This is a model which you designed from various types of machines used in France?

Mr. BREESE. Yes, sir. They have a series of Penguins, an easy one for beginners, then a more difficult one, and then a very difficult one. This one of ours is very difficult to handle. The idea is to teach the men who have already flown, but who have only flown on something

comparatively slow and heavy. One difficulty in flying a very fast machine is in getting off the ground; that is where they have the trouble. They take a man who has already learned to fly and they put him in one of these machines.

The CHAIRMAN. If I understand you, you mean to say that ordinarily the aviator who is taught to fly by the use of what we call a training plane finds it difficult to get off the ground properly with the fighting machine, when the experience that he has had has been limited to training planes, and the purpose of this machine is to fill that gap in training machines, and it is to enable the man accustomed only to training machines to properly leave the ground when he is transferred from a training to an actual fighting machine.

Mr. BREESE. He gets that training on something that is inexpensive and not very dangerous.

Senator FRELINGHUYSEN. You have a contract for 300 Penguins?

Mr. BREESE. Yes, sir.

Senator FRELINGHUYSEN. There is no other future contract contemplated, is there?

Mr. BREESE. Not so far as I know.

Senator FRELINGHUYSEN. I have noticed that you have some good ideas with reference to wing making. Have you facilities for building other training and combat planes in this factory?

Mr. BREESE. Yes, sir; we can build anything they can build anywhere else.

Senator FRELINGHUYSEN. Do you feel that you would like to offer these facilities to the Government for other work than the manufacture of Penguins?

Mr. BREESE. Yes, sir.

The CHAIRMAN. You have had some trouble with the engines which the Government has furnished?

Mr. BREESE. Yes, sir.

The CHAIRMAN. To what extent has the engine trouble delayed your production and delivery?

Mr. BREESE. There are 45 machines on the floor that would have been on the field by now.

The CHAIRMAN. You have been compelled to store a number away?

Mr. BREESE. Yes, sir.

The CHAIRMAN. About how many machines could you have delivered up to this time if it had not been for the defective engines?

Mr. MORRISON. I would say we would have half the order completed—150 machines.

Senator REED. How many have you delivered?

Mr. MORRISON. Forty-four. We are not working full now.

The CHAIRMAN. You have a factory filled with machines that are stored for lack of engines, which the Government is furnishing?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. You will be unable to furnish machines in quantity until your engine troubles are relieved.

Mr. MORRISON. They have about fixed that up now. They are going to ship Saturday.

The CHAIRMAN. How long has this difficulty extended?

Mr. MORRISON. There is the inspector's report sent here by the Signal Corps—Mr. J. B. Reed, who verifies our statement about the engines.

The CHAIRMAN. You had been complaining long before May 25?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. You got some relief on May 25 through an inspector reporting about that time in consequence of your previous complaint?

Mr. MORRISON. Yes, sir. This man was sent here by the New York department of the Signal Corps to look over these engines.

The CHAIRMAN. You mean Mr. Reed?

Mr. MORRISON. J. B. Reed.

The CHAIRMAN. Can you give us a copy of his report also?

Mr. MORRISON. Yes, sir.

The CHAIRMAN. Has the situation improved recently?

Mr. MORRISON. Well, we have not received any motors yet.

The CHAIRMAN. When are you assured of the receipt of motors?

Mr. MORRISON. Our senior inspector has returned from the factory at Chicago, where he has been going over the subject, and either the general manager or the head of the firm assured him he would ship some on Saturday next.

STATEMENT OF MR. CARL HENDRICKSON.

The CHAIRMAN. You are from Chicago?

Mr. HENDRICKSON. Yes, sir.

The CHAIRMAN. Sent here by the Excelsior Manufacturing Co.?

Mr. HENDRICKSON. Yes, sir.

The CHAIRMAN. To look after the engine difficulties that the Breese Co. is experiencing?

Mr. HENDRICKSON. Yes, sir.

The CHAIRMAN. When did you arrive here?

Mr. HENDRICKSON. Tuesday noon; about 11.30.

The CHAIRMAN. What were you instructed to do by your company?

Mr. HENDRICKSON. To look up the trouble with the engines.

The CHAIRMAN. Did you find much trouble with the engines?

Mr. HENDRICKSON. There was a whole lot of different parts. There were a lot of bolts and nuts in a bad condition and a leaky gasket.

The CHAIRMAN. Were you instructed to repair them here?

Mr. HENDRICKSON. Yes, sir.

The CHAIRMAN. Can you do that?

Mr. HENDRICKSON. I can with most of them. One I can not touch. I have got to ship it back to the company.

The CHAIRMAN. Do you think it is necessary to ship more than one?

Mr. HENDRICKSON. No, sir.

The CHAIRMAN. Do you think you can fix the others all right?

Mr. HENDRICKSON. The others will be O. K.

The CHAIRMAN. Who inspects them after you have repaired them?

Mr. HENDRICKSON. The Government inspector.

The CHAIRMAN. Is the Government inspector here to do that?

Mr. HENDRICKSON. Yes, sir.

Senator REED. What is the reason they are in bad shape?

Mr. HENDRICKSON. Poor workmanship. They are not looked after by the Government inspector. They should not pass the Government inspector. He should not let them pass.

Senator REED. There is bad work done in the factory?

Mr. HENDRICKSON. Bad work done in the factory.

Senator REED. And bad factory inspection and bad inspection by the Government agents?

Mr. HENDRICKSON. Yes, sir.

Senator REED. All that takes place before it comes here?

Mr. HENDRICKSON. Yes, sir. Here is a little trouble with the propeller key, because they have not got a wrench.

Senator THOMAS. Is that a part of the engine difficulty?

Mr. HENDRICKSON. No, sir. Our company is not supposed to supply that before they get instructions from Washington.

Mr. MORRISON. We furnish a kit of tools with our end of it.

Mr. HENDRICKSON. There is supposed to be a complete set of tools with that engine.

The CHAIRMAN. Who is to send that?

Mr. HENDRICKSON. The company should send it as soon as they get instructions from Washington.

The CHAIRMAN. Why have they not had instructions all the time to send tools?

Mr. HENDRICKSON. They have written to Washington a couple of times, but they never got any answer.

The CHAIRMAN. You mean the company at Chicago wrote to Washington?

Mr. HENDRICKSON. Yes, sir.

The CHAIRMAN. And could not get a reply?

Mr. HENDRICKSON. No.

Senator REED. Why should they not send them without waiting for orders from Washington?

Mr. HENDRICKSON. They made the contract in that way, that they do not have to supply the tools until the Government orders them.

The CHAIRMAN. Is there any improvement in the engines sent here lately from the Excelsior Manufacturing Co.?

Mr. HENDRICKSON. No.

The CHAIRMAN. So that there is about the same average of defective engines coming here as before?

Mr. HENDRICKSON. I would not say exactly that. I do not think they will come again.

The CHAIRMAN. You mean you do not think the bad engines will continue to come?

Mr. HENDRICKSON. They will be in better condition later on. They have taken up some of that trouble. Mr. Morgan was the inspector to talk about that trouble.

The CHAIRMAN. Who is Morgan?

Mr. HENDRICKSON. The inspector.

Senator REED. What country was he born in?

Mr. HENDRICKSON. Denmark.

Senator REED. How long has he been here?

Mr. HENDRICKSON. Twelve years.

Senator REED. Is he a citizen now?

Mr. HENDRICKSON. Yes, sir.

Senator REED. Mr. Morrison, will you put in the record, when it comes to you for correction, the wages that you pay your men?

Mr. MORRISON. Yes, sir.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JUNE 21, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Mineola, Long Island.

The subcommittee met at Mineola, Long Island, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF SECOND LIEUT. FELICE TESTONI.

Senator REED. Please state your name and your rank in the Italian Army.

Lieut. TESTONI. Lieut. Testoni, technical department of aviation, experimental engine section. My special duty is to test engines.

Senator REED. You are an expert in the matter of engines?

Lieut. TESTONI. Yes, sir. I am a member of the committee. I am a member of the committee inquiring into the Liberty motor, representing the Italian Government.

Senator REED. Who makes up the committee?

Lieut. TESTONI. Two Italians, one French, and two English officers. I represent the Italian Government on this committee.

Senator REED. What is your opinion of the Liberty motor?

Lieut. TESTONI. I can not speak on that, because I was asked not to. I swore that I would not talk about that. I signed a paper in which I bound myself not to speak.

Senator REED. When you went on this committee?

Lieut. TESTONI. When I was asked to go upon this commission I was asked to bind myself not to speak about the Liberty motor. This took place at Cleveland.

Senator REED. Who asked you not to speak?

Lieut. TESTONI. The president of the committee.

Senator REED. What is the president's name?

Lieut. TESTONI. Mr. Crane, chief engineer of the Simplex factory, at New Brunswick, N. J.

Senator REED. Of course, Mr. Crane did not mean that to extend to a committee of Congress, but we will not insist upon that.

Lieut. TESTONI. I am a soldier, and I can not speak.

Senator REED. We will get you released if we want that information. What kind of engines do you find most satisfactory in your Italian service?

Lieut. TESTONI. There are three types of engine. We make three different ones. There is one type for big machines, reconnaissance machines, one type for the Caproni machines, and another type for the S. V. A. machines.

Senator REED. What is the engine that you use in the S. V. A. plane?

Lieut. TESTONI. It is the S. P. A. engine. I was specially charged when I came over to look after this special machine. I came in the beginning to look at that special machine; that is, up to the day until this machine was tested. After that I was appointed to look after all kinds of Italian machines in America. As a matter of fact, I looked after American machines—all kinds of machines.

Senator REED. How long have you used the S. V. A. flying machine in Italy?

Lieut. TESTONI. The first S. V. A. machine was flying in Italy, in Milan, in March of last year.

Senator REED. What speed is that machine, equipped with an S. P. A. engine, capable of making?

Lieut. TESTONI. There are two types. We have two types of machines. One is the type that we have just seen on this field, the one which has been flying, which is the small machine. One is the machine equipped with a smaller engine. That is the type that you have just seen flying. The horsepower of that engine is about 215. That machine was tried out in the presence of Gen. Foullois at Langley Field. Gen. Foullois is now in France. It makes a speed of 133 miles per hour. After repeated tests in Dayton—at the Wilbur Wright Field at Dayton—it made 133 miles per hour. With a head wind at Langley Field we made a height climb with a complete war load, three hours of fuel, of 4,700 meters in 19 minutes and 19 seconds. These are the two tests that we have made with the S. P. A. in the S. V. A. machines in the United States.

Senator REED. That was with the 215-horsepower motor?

Lieut. TESTONI. Yes, sir.

In France, before the Inter-Allied Committee for Aviation, they tested the other machine, with the same engine, but with high compression. The engine we have shown you here to-day, which stood the test which I have just referred to, is a low-compression engine. The engine I am now speaking of, which was tested in France, is a high-compression engine, but is the same make of engine, with a horsepower of 255. The engine also is lighter in weight than the one you have seen tested to-day. It is a new and improved type of the same motor. It is the same type of motor that you have seen used to-day, but it is preferred and is regarded as so much of an improvement that it is completely taking the place of the low-compression engine, which is no longer built in Italy.

Senator REED. It was this low-compression motor which you have practically abandoned that was in this machine that gave the wonderful performance that I saw to-day?

Lieut. TESTONI. Yes.

Senator REED. Please give me the results of the tests of the new engine.

Lieut. TESTONI. The speed was 237 kilometers per hour, and 4,000 meters in 12½ minutes for climbing with full military load and three hours of fuel. That is the official record.

Senator REED. Is not that one of the very fastest machines built?

Lieut. TESTONI. The machine built in Paris was the fastest machine.

Senator REED. Can you give me the official record of these tests in Paris?

Lieut. TESTONI. These are the official records taken by the Inter-Allied Commission.

Senator REED. I want to ask you about the ability of the machine to run at low rates of speed, or about your ability to throttle it down so that it will run very slowly.

Lieut. TESTONI. The lowest possible speed is about 35 miles, with the air perfectly still.

Senator REED. Of course it can go at a slower speed with a head wind.

Lieut. TESTONI. As it was to-day, it was going about 10 miles an hour.

Senator REED. That is a very low rate of speed.

Lieut. TESTONI. The defect of every machine, or all fast machines built, is that they are obliged to land at a very great speed, which makes landing dangerous. This particular machine can land at that speed, which is a wonderful feature. It is the lowest speed that has been obtained from a fast machine. This is very important. It is very important at the front, especially, because these fast machines are bound to stay in the first line, and there it is difficult and dangerous to have a large landing field, because they will be seen and will be bombarded. They have to land in small places, and it is possible and safe to land in small places if you have low speed.

Senator REED. I shall not ask about the flying machine itself, because I take it that it is composed of the same materials as the other flying machines, and therefore can be produced in this or any other country, but I want to know where these engines—these S. P. A. engines—can be procured and in what quantities.

Lieut. TESTONI. In Italy.

Senator REED. I want to know how the United States could get these S. P. A. motors and get them in quantities.

Lieut. TESTONI. At the present time in Italy there are four factories building S. P. A. engines. There is the Ansaldo factory, the Breda, and the Officine Meccaniche di Arerzo. All these factories are producing the S. P. A. motors, following the drawings submitted to them by the S. P. A. factory by the firm that has been manufacturing it.

Senator REED. How long has that engine been in existence?

Lieut. TESTONI. The first S. P. A. motor factory has been producing aviation motors ever since 1905. The type of this machine you have seen flying was built in 1916.

Senator REED. What is the ability of these Italian factories that you have named to produce these motors in quantities?

Lieut. TESTONI. I think to-day it is about five or six every day. I do not know about all the factories, but there are some larger factories that have larger production. The Italian factories that I have named do not even, when they get some of their parts from America, produce these motors as fast as they need them in Italy. We have not even the raw materials.

Senator REED. How, then, can America get these motors?

Lieut. TESTONI. There is an agent in New York of the S. P. A. factory. This authorized agent of the S. P. A. factory has offered ever since last October to build the S. P. A. motor in the United States. We have standardized the production of those motors, so that with the same cylinder and the composite parts, connecting rods, and so on, we can build 6, 8, 12, and 16 cylinder motors.

Senator REED. How many cylinders did this engine have?

Lieut. TESTONI. We had six cylinders in the machine used to-day, which is a scout machine, but for a machine that is to be used for bombing, or any of the larger machines, we can use more cylinders.

Senator REED. Was this agent of the Italian Government as early as last October ready to permit our Government to build the S. P. A. engine?

Lieut. TESTONI. He not only was willing to permit it but offered to build them, practically, because he had in back of him a financial group of men that were going to assist him, and he offered to build them in the United States. He has asked the Army administration and the Navy administration to make official tests of the machines. The Army administration has refused to have any tests at all, saying that they were not interested, while the Navy administration allowed them to make these tests in January last, which were made at the navy yard in Washington and the aviation engine department in Washington.

Senator REED. Did you yourself talk with the Army officers about testing out this machine, or was that done by the Italian agency?

Lieut. TESTONI. The agent made the offer.

Senator REED. What is the agent's name? Where can I find him?

Lieut. TESTONI. Mr. Dockendorff, 20 Broad Street.

Senator REED. What was the reason given why the Army would not test the machine?

Lieut. TESTONI. They said they were not interested.

Senator REED. Do I understand that Mr. Dockendorff had the plans necessary to produce this engine and had a sample engine with him?

Lieut. TESTONI. Mr. Dockendorff made his offer stating that he had financial people back of him. He had all the drawings necessary to put the engine into production. We have one motor right here now, and had it then, and this man was here as a technical man to teach and assist the Americans to build them if they decided to build them.

Senator REED. Did you take this engine out to the Wilbur Wright field?

Lieut. TESTONI. Yes, sir; and made an official test.

Senator REED. What kind of treatment did you receive out there?

Lieut. TESTONI. Very fine treatment. All of the Italian engines—not only the SPA—were shipped to McCook field first instead of to the Wilbur Wright field. There they found out that one of the cases of a Fiat motor had been opened. They did not know whether it had been an accident or whether it had been done purposely. It is a tin case. Inside they found it broken and cut. After that they were shipped to the Wilbur Wright field. During the transportation they broke another Italian airplane, the SIA. The American authorities had written the Italian people requesting them to make

the test in Dayton, Ohio. When everything was landed in the Wilbur Wright field the American authorities wrote that the SIA planes did not interest them; they were not interested in the SIA and the Pomiglio. They were not interested in those two kinds of machines, and to test only the SVA. The result you know, because we have got them.

Senator REED. Now, you have mentioned two machines. Please describe those machines.

Lieut. TESTONI. The SIA and the Pomiglio are two reconnaissance planes fitted with the same motor—the Fiat motor. These two machines were first tested, before being sent to the Wilbur Wright field, in the Langley field, before Gen. Fullois, and the official results of those tests, if they interest you, we will be glad to send you.

Senator REED. We will send you a copy of these notes, and there will be a blank space left here to put in the official tests of those machines.

Senator REED. In a general way, what are the virtues of those two machines?

Lieut. TESTONI. At our front they were using them. We are not so fond of these machines. We have had some trouble with the SIA and the other one.

Senator REED. I want you to tell me before I forget it, What is the length of flight, how much fuel you can carry, and what would be the length of flight which is possible with the SVA machine?

Lieut. TESTONI. A speed of over 200 kilometers per hour, or about 210 kilometers per hour. We have already made tests in Italy in which the machine flew for five and a half hours without stopping. One of the records is from Turin to Udine and back. You can measure the distance for yourself.

Senator REED. I wish that later on you would put in a list of some of these trips at this point.

Lieut. TESTONI. Yes, sir.

Senator REED. Is it not possible, with the machine that you have here to-day and with this older type of engine, to fly from New York to Chicago without a change of fuel?

Lieut. TESTONI. We will do it in 15 days. We are getting ready for that test.

Senator REED. I want to ask you now why it is, if you know, that the Government did not take this SVA plant and the SPA machine or motor?

Lieut. TESTONI. They have in Dayton all the drawings and models and all the things necessary, and scores of engineers have been going to Dayton to copy it in every way, but then after that they were told that the machine did not interest them.

Senator REED. Will you kindly tell me what your experience in this country has been with the Caproni machine, as to getting the Government interested in that?

Lieut. TESTONI. As to the Caproni machine, I know this, that the Government will say, "We will do it," and then "We will not do it," and then they will say, "We will do it"; and yet they do not do it.

Senator REED. You mean that the Government has indicated from time to time that it would enter upon the production of the Caproni

machine in large quantities, but that it has failed to do what it had stated it would do?

Lieut. TESTONI. I just heard that. One day they were proposing to make 1,000; the next day they were not going to make any more. and so on.

Senator REED. You heard this. You heard it from your associates who were discussing their various experiences with our Government?

Lieut. TESTONI. Yes, sir.

STATEMENT OF LIEUT. LEOPOLDO BELLONI, OF THE ITALIAN MILITARY AVIATION SECTION.

Senator REED. Will you please tell your experience in getting Caproni production started in this country? Just tell us briefly, giving the previous experience of Mr. Caproni as you have learned it through your connection with him.

Lieut. BELLONI. I am here for the production of Capronis. I was sent here by Mr. Caproni about two months ago. Mr. Caproni told me that in October last he was summoned to go to Paris and get in touch with the official representatives of the United States Government over there on the Interallied Commission for Aviation, and he was asked whether he was willing to assist the American Government to build Caproni machines. They discussed the matter to a certain extent and came to this conclusion, that Mr. Caproni was going to build and would have technical control of a large factory at Bordeaux, France, where there should be at least 25,000 Italian laborers to assemble 1,000 Capronis per month that would have been shipped in separate parts from the United States. Caproni went to Bordeaux and selected the land or the ground where the factory was to be built and returned to Italy. As emigration has been stopped ever since the war broke out, after a long discussion he came to an arrangement with the Italian Government, and the Italian Government was going to allow 25,000 skilled laborers, all trained in the Caproni factory in Italy, to go to France and assemble there 1,000 machines per month.

Senator REED. The machines to be made in the United States?

Lieut. BELLONI. Yes, sir. The machines were to be made in the United States. As a reward for this subtraction of men from the Italian market the United States was willing to give a certain amount of the output of the Caproni machines to be used on the Italian front. After that Caproni had to go to Italy to attend to business there, as the offensive was going in. He had settled with these people in Paris the price of the machines and the royalty, if there was any royalty, that was to be paid for them. He was to be allowed an indemnity of \$5 for each man that he would instruct for the damage that these people, while being instructed, would possibly do to his material. That is because in order to learn they have got to spoil some things. After a month he went back to Paris and found out that they did not want to go ahead any more on the program. They said that instead of sending them to France to send the technical men to America and to build and assemble them in America. So he, at his own expense, sent here about 19 skilled foremen, headed by Capt. De Annunzio, chief engineer of the plant in Milan. At his own expense these people came here with the drawings necessary to

build what we usually call the 600-horsepower biplane. They were sent to work in the factory of the Standard Aircraft Corporation, in Elizabeth, N. J. Of the original program nothing was said, and the result is that so far only one Caproni machine has been built in the United States, and that, we hope, will fly in a few days with the Liberty motor.

I am here to organize in a private way, asking the help of private capital, if necessary, and to get factories where we could produce these and other types of the Caproni machines. The American authorities, I hope, will back me up. We have been here for months. Mr. Caproni has been at an expense of approximately \$10,000 per month. We have had one of our best pilots killed. We have had models and planes here, and we are willing to produce the latest model. We want to help. We want to get the Government of the United States to take hold of production, and, if not that, we want to get private capital to take hold.

I would like to attach a picture of the new triplane of 900 horsepower. These four planes have been sold to the English [indicating].

Senator REED. Did the Navy order any of your machines?

Lieut. BELLONI. Not in America. We made tests for the Navy, but they did not order any. The Navy has ordered Capronis in Italy.

Senator REED. If you have a letter from any officer requesting that these machines be built—any officer in France or in the foreign service—please attach a copy of it.

Lieut. BELLONI. Yes, sir. I will do this as soon as the addressee will give me permission to do so.

Senator REED. I think that is all. I thank you very much.

(Whereupon the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

TUESDAY, JUNE 25, 1918.

**UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.**

The subcommittee met in the room of the Committee on Military Affairs, Capitol Building, at 10.30 o'clock a. m., Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Smith of Georgia, New, and Frelinghuysen.

Also present: Mr. W. H. Workman, Washington, D. C.

STATEMENT OF MR. W. H. WORKMAN, LAFAYETTE HOTEL, WASHINGTON, D. C.

Senator NEW. In anticipation of Mr. Workman's appearance before this committee, and after a talk with him covering the general line of testimony expected, he has, at my suggestion, made a written statement of conditions as he sees them, and I suggest, Mr. Chairman, that he be permitted to read that statement.

The CHAIRMAN. Does that statement involve any matters you have already testified about? We do not want to duplicate. You may proceed.

Mr. WORMAN. Of course, you gentlemen have been out on inspection while I have been in Europe, but the information I will give you here is probably information which has been obtained within the last 48 or 72 hours.

For the second time this year I appear before a committee of the Senate to give evidence regarding the aircraft situation in this country.

I have just returned from a quick trip to England and France, where I had conferences with American, English, and French officials and Mr. Handley Page. I found a very keen interest in knowing the truth regarding our aircraft preparedness, and in so far as my knowledge permitted I told all the situation. I made suggestions where England could assist this country, and I am glad to say they have been followed out by the sending to this country three of the most prominent factors in the success of England's air force. They are now conferring with and advising officials, and I hope that their advice will be followed out. Probably you have noticed what Gen. Brancker, the head of the mission, has said in the papers during the past few days.

The position of the war, regardless of the flamboyant reports we read in the papers, is in its most critical stage, and will continue to be throughout the summer. The allies are being sorely pressed, and I fear, although hope against it, that channel ports may be in German hands before September.

Senator FRELINGHUYSEN. That is your own opinion, is it not?

Mr. WORKMAN. Of course, it is my opinion, but it is expressed as my own experience and the experience of others right out there in France. I know the first aviation camp of England, for instance, at St. Omer, and on which was spent \$10,000,000 in getting it ready, had to retreat after that last push and came down between Calais and Boulogne. The German front line is only 35 miles away from Boulogne. Of course, they hope they are not going to get them, but they have to put it that far away—the aviation base—to keep them from getting it.

New developments have taken place in aeroplanes and motors. In France and England 500 and 600 horsepower engines are being made, and 800 horsepower is being experimented with for 1919 production.

Faster scout and fighting aeroplanes are being developed and produced, and, I think, France and England are far enough ahead of the Germans in this development not to cause any worry.

New daylight and night bombing types of aeroplanes have been developed, including the new Handley Page machine, to which I will refer later.

I had occasion to see Liberty motors in action in England and France, and, together from what I was told while there by American, English, and French officials, I would say that basically the motor is all right, but there are many things which must be done to it to make it a good consistent 300-horsepower motor. The chief trouble being carburetion, next cooling and lubrication, and a greater falling off of its power at altitudes than should be. I understand that a new carburetor has been tested out and recommended and adopted by the English for the motor. These remarks on the motor do not apply to the shipment which arrived in England about May 20, made by the Lincoln Motor Co. I think that if an investigation were made and the truth told, that every other shipment had given much trouble.

Senator FRELINGHUYSEN. Right there, I thought it was 400 horsepower.

Mr. WORKMAN. It is only developing about four-fifths of its reputed horsepower over there so far.

Regarding planes shipped. A shipment of D. H. 4's arrived in France while I was there, and to use the word "rotten" of the aviator who was sent from England to fly them for a test would explain what he thought of them, and I think nothing further need be said.

This brings me to the point where I arrived back in this country, and which I consider more important for the moment. I have followed the changes made here in the administration of the aircraft, while away from this country, and I returned full of new hope and confidence that something was really being done, and I regret to say that I can not feel we are any better off than we were six months or a year ago. A few names have been changed, but the faces

remain the same and, in consequence, no new things have developed, nor has any change or improvement been made in production. This last remark does not apply to the military aeronautic department, as I believe they mean to get what military requirements demand if possible.

Explaining further what I mean about present stage of production, I believe I betray no confidence when I say that due to inferior work and lack of technical knowledge that the Bristol Fighter program has been scrapped until it can be redesigned. The D. H. 4 program is about 33½ per cent efficient, due to structural and material equipment being unnecessarily added.

The Handley Page production is something about which I know more than any other, and I will say I consider it in a very dangerous position. When I left this country, the first machine was supposed to fly June 1. When I returned I found it had not flown and would not until July 1, and I fear it will be several days after this date before it finally takes to the air. I am giving you copy of report by Mr. Chamberlain on this position. Just a word about Mr. Chamberlain. He has been with the Handley Page Co. for several years. He helped to produce the first machine of the O-400 type in 1915 and assisted in production of these in England ever since until he was sent by the company to this country at the request of the Signal Corps to look after this work for the United States Government. The reason for this explanation is that engineers in this country handling the Handley Page production have seen fit to make alterations in construction of this machine over Mr. Chamberlain's objections, and we are in grave danger of that machine only being about 50 per cent efficient. However, I will let this point rest here until after the machine is weighed and flies. Then, if you desire, I shall be pleased to give you the true report of all tests to which it must be put. Right here I would like to say that for argument's sake I will concede that the aeronautical engineers of this country know everything there is to know about design and aerodynamics, which enables them to probably revolutionize aeronautical development, but I can not feel that any of them know more about the design of the Handley Page machine than Mr. Handley Page himself does or any of his men sent here to follow foreign practice of construction.

As you know, parts of this machine are being made here to be sent abroad for assembly. Some of the parts are made, others are being made, some are not yet made, and from the report of Mr. Chamberlain you will see that there is some delay with the production of bomb gears and engine nacelles. In any event, the most sanguine outlook, in my opinion, is that complete sets of parts will not be in England until late autumn or probably about November 1, and machines completely assembled before January 1 of next year.

The production of motors for the Handley Page machines is not at all promising, and might even fall far behind the production of complete sets of parts. In consideration of all this, please know that the English Government worked day and night since last January to put up buildings for the assembly of these parts and to have the buildings ready when the first complete sets were promised, namely, May 1 of this year. These buildings are now ready, and have been since May 1, and will operate with something like 14,000 hands, and

you can realize how disappointing it is and what effect it has upon our allies confidence when the above facts and figures are known and borne in mind. Bricklayers, carpenters, etc., were sent from this country by the British Government to get the work finished by the above date.

The CHAIRMAN. The Wrights are producing the engine for the Handley Page?

Mr. WORKMAN. You see, one engine has to have a left-hand cam shaft to make the propellers revolve counterclockwise. One hand goes clockwise and the other hand goes counterclockwise, and I am told that on account of the pro-Germans around some of these factories a lot of these gauges and tools are missing, so they can not proceed until they get new gauges and tools.

The CHAIRMAN. In what places—in what factories?

Mr. WORKMAN. They did not name the factories.

The CHAIRMAN. That is the trouble about those statements and rumors. We can not locate them.

Mr. WORKMAN. I will run it down if it is of any interest to you.

The CHAIRMAN. It is a matter of tremendous interest to the country.

Now, I would like to feel different than I do and be able to throw a much better light on the situation than I have done, but, under the circumstances, it is impossible, and, what I consider even worse, unless some very drastic changes are made, and immediately, I do not think the position will get any better.

There is a reason for this, and there is a remedy.

The reason: There is an utter lack of technical ability in this country to cope with the situation and supply the military demands, and what there is here, unfortunately up to the present time, is subordinate to production, and in the case of producing these foreign-designed machines, they take the liberty to make changes in the design and alterations in specifications, with the result as mentioned above. This, I think, more than anything else is the cause of our failure so far.

The remedy: We must do exactly what other countries are doing:

(a) Take into consideration military demands and requirements.

(b) Study the types of machines necessary to supply these demands and requirements.

(c) Produce them. If we have no design in this country to fulfill these, then take up foreign design and make an identical Japanese pattern-design production of it.

(d) Make production subordinate to all these, and do not permit anyone or any group of so-called production experts to dictate to the military what they must take and how the military must take it, but turn the tables clear around and let the military and technical departments say what shall be produced and how produced, and then let production do their work.

(e) Do not put all of our eggs in one basket. England can not afford to do it, neither can we. Do you not think for a moment that if there was any logic in the argument of mass production of one motor or one aeroplane for all purposes, that England would prefer doing just one production of one type of each? Everything can be and must be produced as it is in England, and when something else comes along much better, go in and make that, then there is not so

much loss of time and in equipment and machinery. As, for instance, I will explain: This country has been working on equipment and production of Handley Page parts since last September. The explanation above is the result. In the meantime, in England we have produced this type by the hundreds, and also since last November Mr. Handley Page has designed, developed, and produced a new type which will be in production on a large scale on and after August 1 of this year, and some hundreds of these will be made before the United States, with their present production system, can get any complete sets of parts in England, and before the machines are flying in France we are running a chance of the machine being in a state of obsolescence.

So far I have been quite critical and destructive, and I will now close my narrative to you by presenting something constructive and what I consider, as far as bombing is concerned, a way out.

Attached you will find copy of letter written to Gen. Kenley, and attached hereto the proposal which I will make to the United States Government and carry through. By adopting such a proposal, I feel we will be—

(1) Giving the military what they need.

(2) Make production produce it.

(3) Overcome the shipping difficulties.

(4) By having Mr. Handley Page and his staff here, we can do the same as we do in England and turn out machines in large numbers. And, by so doing, we will eliminate this unskilled, inexperienced alterations, which so far have caused failure, which will get us somewhere toward winning the war and saving American lives, together with the lives of our sorely pressed allies.

The CHAIRMAN. Your suggestion about having Mr. Page here, presupposing if he comes here, he shall have authority?

Mr. WORKMAN. Yes.

The CHAIRMAN. And exercise it in those factories where his machine is being produced. Now, we have a staff here in connection with the Caproni, but they have no authority whatever in connection with its production; so if Mr. Page should come over—

Mr. WORKMAN. Of course he would not come unless he was given authority.

I have another statement here, which will explain what I am prepared to do:

PROPOSAL WHICH MR. W. H. WORKMAN, ON BEHALF OF MR. HANDLEY PAGE, OF LONDON, ENGLAND, WILL MAKE TO THE UNITED STATES GOVERNMENT AND BACK IT UP WITH RESULTS.

(1) That the United States Government requests, through the British Government, that Mr. Handley Page come to this country, accompanied by his technical staff necessary to carry out the work outlined below.

(2) That the United States Government place at the disposal of Mr. Handley Page plant and facilities, without any restrictions of any kind or nature, to build his aeroplanes of any type which the military requirements demand.

(3) That the United States Government construct buildings for erecting purposes in close proximity to other plant, taking into consideration the flying field and testing grounds.

The CHAIRMAN. They have not any ground there as I understand it.

Mr. WORKMAN. That is a wrong thing to do. There are certain facilities and plants and ground in this country available to take that point into consideration when placing contracts.

The CHAIRMAN. That is true. We discussed that with the Standard people.

Mr. WORKMAN. At any rate the master of Semphill went over there last week and came back here Saturday morning and told me he had told them to keep the machine there and he would fly it from there. He knows the Handley Page.

Senator FRELINGHUYSEN. They can get another field near there.

Mr. WORKMAN. He is going to fly it from there; if it is possible at all to get it up off the ground there, he will do it.

(4) That equitable and reasonable arrangements for both the United States Government and Mr. Handley Page be made for the work done. This also to apply on all benefits so far received by the United States Government from any production so far accomplished or will follow on Handley Page machines and all use to which his designs and drawings have been put by American designers, engineers, and officials in working out designs to be produced under other names.

The CHAIRMAN. Why should not that arrangement be made between the two Governments?

Mr. WORKMAN. That arrangement can be made between the two Governments if the English Government is willing to pay up. They have not shown any disposition so far to do so. Mr. Handley Page has not get a dollar for his stuff.

(5) That arrangements be started at once to deliver all aeroplanes via the air across the Atlantic to the Azores or Ireland. These arrangements to consist of—

(a) Preparing landing and refueling facilities at the Azores or Ireland, same to be done at departure station on this side of the Atlantic.

(b) Schooling wireless operators for the trips.

(c) Preparing flying organization to take the machines across, such organization to consist of two pilots, two mechanics, and one wireless operator.

(6) I advocate the Azores route preferably on account of the clear weather compared to the North Atlantic weather, and also on account of the shorter route. From St. Johns to the Azores is about 1,250 miles. One of the islands has a volcano 7,000 feet high and is visible 56 miles from the deck of a ship on a clear day, and would certainly be visible from 100 miles away at a height of 2,000 feet, with the clear weather conditions that attain in the Azores. From the Azores to Portugal is 700 miles and the distance from the extreme western to the extreme eastern island in the Azores is about 300 miles. Directional wireless can be used, which will be in constant touch with all incoming and outgoing machines.

With the new 4-engine type of Handley Page machine, and with its flying radius of 15 hours, the trip can be made with the machines ready for service at the front without any alteration or extra preparation. The O-400 type of Handley Page machine can make the trip by installing an extra tank of gasoline, which can easily be done, and still carry the weight of the personnel and other equipment in good time.

(7) I advocate all of this for many reasons.

(a) Facilitate delivery of aeroplanes to the western front. I am given to understand on very good authority that next month will see the quay side of eastern ports blocked with aerial equipment, due to lack of shipping space, and as each month rolls around this condition will grow worse, and this is going to be a very lame excuse to give to Gen. Pershing and the United States Army in the autumn of 1918 and the spring of 1919.

(b) The loss, if any, will be at a very low mark. The chance for loss is nothing to be compared with the danger of complete shipments, or those which can be shipped, being lost on account of submarine warfare.

(c) I can not think that there is any danger at all connected with such an undertaking, and, therefore, that the loss of life of personnel should even be considered. If it is considered, then it should be compared with the greater loss of life on the western front not only in the air but in the trenches, due to

the lack of adequate numbers of aeroplanes to carry on the work necessary for large numbers of aeroplanes to do.

(d) I understand an argument is put forth that such a trip would take 20 or 30 hours' life from the motors. I will say, against this argument, that aeroplanes with motors having had 20 to 30 hours' wear on the western front are better than aeroplanes with motors stacked up in some American port due to lack of shipping space.

(e) The training the pilots will receive in observation work and long-distance flying will be better than all the training they can receive here, and will prepare them for the long-distance work they must do from the western front over Germany and return.

(f) The effect upon the morale of the Germans. They will naturally think if we are flying the Atlantic that they can expect some real aerial fireworks within a very short time from the time we commence.

(g) I believe you will find upon inquiry of the British Admiralty or royal air force that the navigation has already been worked out. After the flight is once made, it will be just as easy as crossing the English Channel is to-day, compared with what it was in 1914, when large prizes were given for the first flight. And I believe that an endless chain of aeroplanes could connect this continent with the continent of Europe every day, and they would pilot each other across.

(h) What I have suggested in preparation for the Azores route also applies to the Ireland route, with the exception, due to the longer course, that an extra tank of gasoline would have to be installed in the four-engine type.

(8) If America is to do anything in aviation in the spring of 1919—we have lost our chance to do anything in 1918—it must be with large numbers of efficiently constructed aeroplanes, and with great military value, such as the multiple-engine machine. I do not mean 500 or 1,000 of these; I mean 10,000 to 20,000 of them. Under present methods and policies as employed in America, in the first place, we will not have anything efficient, and, in the second place, we can not have the large numbers necessary due to shipping conditions. I am given to understand that on a year's basis it would take about 5,000,000 tons of shipping to get 20,000 aeroplanes and all attachments to France.

I feel my outlined solution above to be a practical one without a single exception. But to carry it out decision to do so must be made at once. Next month will be too late again.

(9) With the furniture companies, piano factories, sewing-machine cabinet-making companies, typewriter factories, body-building companies, together with all the metal works available in this country, and with all the above that I ask for, we, the Handley Page Co., can produce. If Liberty motors can not do the work or can not be produced in large enough quantities, then put into production at once Rolls-Royce, Beardmore, Sampson, Sunbeam Matabile, and these can be made here regardless of organization to prohibit it.

Senator FRELINGHUYSEN. What do you mean by "organization to prohibit it"?

Mr. WORKMAN. This organization here saying a foreign motor can not be made in this country, and the Rolls-Royce is being made here, 1,500 are being made by August 1.

Senator FRELINGHUYSEN. Where?

Mr. WORKMAN. The Stearns; Peerless, of Cleveland; and Franklin motor car companies.

The CHAIRMAN. By whom?

Mr. WORKMAN. The Rolls-Royce Co. and the English Government.

Senator FRELINGHUYSEN. What horsepower?

Mr. WORKMAN. That is the Eagle type, 370.

Senator FRELINGHUYSEN. Will that fly the Handley Page?

Mr. WORKMAN. We use them exclusively.

Senator FRELINGHUYSEN. Where is the Stearns Co.?

Mr. WORKMAN. In Cleveland, Ohio.

Senator FRELINGHUYSEN. Where is the Peerless Co.?

Mr. WORKMAN. They are out in Cleveland; and the Franklin Motor Co., I think, is in Syracuse.

Senator FRELINGHUYSEN. They are making the Rolls-Royce?

Mr. WORKMAN. Yes; making the parts for it.

Senator FRELINGHUYSEN. Where is it assembled?

Mr. WORKMAN. I think some is assembled here and some assembled abroad. I know in talking the matter over with Claude Johnson (we are very keen on this Atlantic flight), and when over there we were talking the matter over, we wanted the Rolls-Royce engine for the first trip, and he said we could not have any from the production in England, but we might be able to get a couple from the production over here, provided we could get them in time to make the trip before summer was over.

Giving us all the above asked for, and every assistance from this country, we can put on the western front anywhere from 2,500 to 10,000 or 20,000 machines by the spring of 1919, without using a single ton of a cubic foot of shipping space, and this can be done if every resource in America—financial, material, and otherwise—be employed, and more—Germany can be defeated and the war won the next year.

The war is costing the allies close on to \$75,000,000 daily. Suppose this program shortened the war by only one day. It would certainly be worth all the cost, but I feel sure that it will not only shorten it by one day, but by months. The financial part of this whole program should not be considered at all, but the one thing to consider is the saving of life, which this program will certainly do. If it only save one life it would be worth the cost and the undertaking, but it will not only save one life but hundreds of thousands of American lives, as well as the lives of our sorely pressed allies.

The CHAIRMAN. What do those machines cost perfectly equipped?

Mr. WORKMAN. The four-engine type complete, with everything, guns, bombs, and everything, we could produce in this country for somewhere around \$50,000. It may be on the other side, under that.

Senator FRELINGHUYSEN. \$50,000 apiece?

Senator NEW. \$50,000 a plane.

Mr. WORKMAN. Here are photographs of the four-engine type.

The O-400 only carry a ton of bombs and three guns and a couple of men. This machine will carry thirty 250-pound bombs, carry 14 guns, and 10 men and will fly 15 hours at 100 miles an hour, at an elevation of 10,000 feet. As I say we will not have to do a single thing to it to get it across the Atlantic. If we are going to fly from our aerial base in France to Berlin and back again, that flight is no greater than from St. Johns to the Azores.

The CHAIRMAN. Did I understand you to say that these opposing engines work in different directions?

Mr. WORKMAN. Yes. This design shown in the photograph is different from your other design. This is the machine we are working on now.

The CHAIRMAN. What I am getting at is the action of your engines.

Mr. WORKMAN. What I said about the action of the engine applied to that and not to this [indicating]. These propellers turn out to the front, then the back propellers turn in, so as to eliminate the wash of the front propeller interfering with the rear propeller.

The CHAIRMAN. They turn in opposite directions?

Mr. WORKMAN. Yes. This is the type we are working on here in this country. One propeller goes counterclockwise, which necessitates the construction of a left-hand cam shaft on the engine.

The CHAIRMAN. What is the wing spread of your big machines?

Mr. WORKMAN. One hundred and twenty-seven feet.

Senator NEW. Do you know what the wing spread of the super-Caproni is?

Mr. WORKMAN. No; I do not. It is around 137 or 138 feet. You are referring to the triplane, are you not?

Senator NEW. Yes.

Mr. WORKMAN. Yes.

The CHAIRMAN. The Handley Page has a wing spread of 106 feet.

Senator NEW. One hundred and twenty-seven feet—the one you are proposing to make.

The CHAIRMAN. I am talking about the Standard—106 feet.

Mr. WORKMAN. We make them 100 feet. Perhaps they have increased. That is just the point, they get beyond and make all these changes and make them over the objection of the man who we send over here to help make them, and there is the whole trouble.

Senator FRELINGHUYSEN. Who is the controlling force in this production—the cause of this confusion?

Mr. WORKMAN. Of course under the old arrangement, Deeds and Waldon and Montgomery and Coffin and those people. I have not really seen any change. I think Mr. Ryan is feeling his way about and sooner or later he is going to strike out and do something.

The CHAIRMAN. Mr. Potter succeeded Deeds and Waldon, did he not?

Mr. WORKMAN. He seems to be going around in circles at the present time; he seems to have lost his equilibrium, in a way.

Senator FRELINGHUYSEN. I do not blame him. I think anybody in this confusion is likely to lose his equilibrium.

The CHAIRMAN. You made a statement here regarding the Bristol, as follows:

I believe I betray no confidence when I stated that due to inferior work and lack of technical knowledge that the Bristol fighter program has been scrapped until it can be redesigned.

What information have you had to base that statement on?

Mr. WORKMAN. That information came from the technical department.

The CHAIRMAN. The technical department of what?

Mr. WORKMAN. The technical department of the military aeronautical section.

The CHAIRMAN. Here in Washington?

Mr. WORKMAN. Yes, sir.

The CHAIRMAN. Who is at the head of that?

Mr. WORKMAN. Gen. Kenly.

The CHAIRMAN. Do they tell you that the Bristol fighter has been scrapped—that the program has been scrapped?

Mr. WORKMAN. Yes.

The CHAIRMAN. When?

Mr. WORKMAN. Last Friday, I think.

The CHAIRMAN. You say that is due to inferior work and lack of technical knowledge. Just what do you mean by that?

Mr. WORKMAN. Well, workmanship. They do not know how to make this light stuff, which is very delicate, in order to keep the structural weight down so when they get the complete machine made it is so heavy that as a fighting machine it is supposed to go very fast, but it can not get up the speed. Then they have made alterations, just as they have on the De Haviland and the Handley Page, which has eliminated it as a type of machine to do the work for which it was originally constructed.

The CHAIRMAN. Who is responsible for the changes in type or workmanship of the Bristol plane; were they made by the Curtiss people or made by the engineers of the Government here?

Mr. WORKMAN. I can not say that.

The CHAIRMAN. When did these gentlemen tell you the program had been scrapped?

Mr. WORKMAN. Last Friday.

The CHAIRMAN. When was the order scrapping the program dated or made?

Mr. WORKMAN. It was dated either the day before or practically on that same day.

The CHAIRMAN. And the program?

Mr. WORKMAN. And the program, and I probably should have used the words "held in abeyance" until they redesign it.

The CHAIRMAN. You mean by that until they go back to its original design and eliminate the changes?

Mr. WORKMAN. Yes.

The CHAIRMAN. Will not this difficulty there be encountered that whereas the Bristol fighter was designed for an English engine, if we go back to that we must get the English engine and substitute it in the machine for the Liberty motor?

Mr. WORKMAN. You are quite right. That is the thing I have contended ever since this country has been in the war, if you want to make Bristol fighters or Handley Page, those machines are designed for certain types of engines and certain types of work. If we are going to reproduce them, let us reproduce them not only from the design of the plane but make the engine, too.

The CHAIRMAN. What engine do the British use?

Mr. WORKMAN. The Sunbeam Arrow type, the 250-horsepower, and the Rolls-Royce and the Beardmore.

The CHAIRMAN. Are those engines available for the Bristol if we continue making planes?

Mr. WORKMAN. You mean is the production in England great enough?

The CHAIRMAN. Anywhere, in England or in this country.

Mr. WORKMAN. No; England is taking up every engine she can possibly make there.

Senator FRELINGHUYSEN. Is not the Sunbeam being made in this country?

Mr. WORKMAN. It could be.

Senator NEW. As a matter of fact is it not made in this country at Syracuse?

Mr. WORKMAN. At Buffalo.

The CHAIRMAN. Was the scrapping of the Bristol plane due to the accident of two weeks ago to-day, resulting in the killing of Mr. Reeder and his companions?

Mr. WORKMAN. That had something to do with it; yes.

The CHAIRMAN. You also say in this statement that the DH-4 program is about 33½ per cent efficient, due to structural and material equipment being necessarily added. What is the source of your information in regard to the De Haviland?

Mr. WORKMAN. The same source as the Bristol.

The CHAIRMAN. Received at the same time?

Mr. WORKMAN. Yes, sir.

The CHAIRMAN. What is proposed to be done with the De Haviland program?

Mr. WORKMAN. A statement was made in an interview I had with Mr. Kellogg last Saturday morning before Col. Arnold, who is attached to Gen. Kenly, in which Col. Arnold told Mr. Kellogg that the military end were not satisfied with this De Haviland production, and from what I had to say they felt the same about the Handley Page, and they felt that my suggestions to help the Handley Page production out should be adopted, then Mr. Kellogg responded:

Oh, well, suppose the De Haviland is not all right, we have had a lot of experience now, and in the new types we are going to make the experience we have had in making the De Haviland will assist us in getting out these new types.

The CHAIRMAN. You have said something here about the test of the De Haviland in France, and you speak of it as being rotten.

Mr. WORKMAN. Yes.

The CHAIRMAN. I wish you would give the committee the particulars, the details on which that statement is based.

Mr. WORKMAN. The aviator who flies the De Havilands for the De Haviland Co., namely, the Aircraft Limited, of London, Mr. Hucks, a man known all over the world was sent over there to inspect. He took one up and came down in it and refused to go up any more and came back to England. He was asked his opinion and he said it was rotten.

Senator SMITH. That was with the De Haviland 4 or the Liberty engine?

Mr. WORKMAN. Yes.

Senator SMITH. One of our recent productions?

Mr. WORKMAN. Yes. The first shipment of D. H. 4's that arrived at Brest.

The CHAIRMAN. The first shipment was one machine.

Mr. WORKMAN. I am speaking now of the first shipment after that.

Senator SMITH. We shipped four the 1st of April.

Mr. WORKMAN. Yes.

Senator NEW. This is one of that four?

Mr. WORKMAN. Yes.

The CHAIRMAN. Was this flight made in England or in France?

Mr. WORKMAN. In France.

The CHAIRMAN. Do you know what disposition was made of the machines consequent upon that report?

Mr. WORKMAN. No; I do not. Of course, I do not know anything about them after that. I was in France at that time, and I crossed the channel in an aeroplane about the same time Hucks got back, and our people were all out there together to see the test of this new Handley Page and were all talking about them and wanting to know

if we were going to get some aeroplanes over from God's country, as England always likes to refer to it.

The CHAIRMAN. Do you know whether any tests of the De Haviland were made while you were over there by American flyers?

Mr. WORKMAN. No; I do not; with the exception of one test which took place at Hendon flying ground along about the 15th of May.

The CHAIRMAN. Was that in France?

Mr. WORKMAN. No, in England; when a D. H. 4 machine was made in England, equipped with the Liberty motor, was put in a competitive test with the new Sunbeam Metabile 425 horsepower motor, and the Liberty was forced down at 6,000 feet, due to carburation trouble.

The CHAIRMAN. Do you know whether the construction of the Bristol plane at the Curtiss factory has been suspended or countermanded by the authorities here?

Mr. WORKMAN. I think I have answered that, have I not, when I said held in abeyance until they can redesign it. I do not know what official instructions have been handed out; I can not say.

The CHAIRMAN. The sum and substance of it is that the Bristol production is suspended subject to further changes in design?

Mr. WORKMAN. Yes, sir.

The CHAIRMAN. Do you know whether it is the purpose of the authorities here to take similar action in regard to the De Haviland 4?

Mr. WORKMAN. I do not think it is; no. I think they promised—as a matter of fact, I know they have promised—the military aeronautical department that within a certain time they will have it made better.

The CHAIRMAN. What type of engine do the British use in the De Haviland 4?

Mr. WORKMAN. The Rolls-Royce.

The CHAIRMAN. Do you know of any other type of fighting machine—two-seated fighter—now in production in America, exclusive of the De Haviland and the Bristol?

Mr. WORKMAN. I do not know; no.

Senator SMITH of Georgia. I should like to ask him a question there.

The CHAIRMAN. I am practically through. You may proceed.

Senator SMITH of Georgia. What difficulty would there have been about building here this engine that the English use in the De Haviland 4?

Mr. WORKMAN. No difficulty at all.

Senator SMITH of Georgia. Would it have been any more difficult to prepare to construct that engine in April a year ago than it would have been to prepare to construct the Liberty, after we had determined what the Liberty engine should be?

Mr. WORKMAN. In my opinion and in the opinion of my associates, and also from the opinion of Rolls-Royce—that is, Claude Johnson, the managing director—it would have been much easier. It takes seven months to have Americanized the production of Rolls-Royce engines; and turn all the high-quality motor builders of this country loose on work of that kind, we could have easily done it.

Senator SMITH of Georgia. What do you mean by Americanization?

Mr. WORKMAN. In England everything is done by hand. Over here we do it by machinery; and there would be little alterations that would be necessary to make in order to Americanize it, or get the engine so you could manufacture it by machinery.

Senator FRELINGHUYSEN. Did you talk with Mr. Hucks, the flyer?

Mr. WORKMAN. I did not see Mr. Hucks, but I saw the manager that was associated with him; that is, the head of the company.

Senator FRELINGHUYSEN. Did you go and ask him in detail why the De Haviland 4 construction was rotten?

Mr. WORKMAN. No; I did not.

Senator FRELINGHUYSEN. Did you gain any information as to whether it was structural weakness in the plane or due to the engine?

Mr. WORKMAN. No; I did not have time for that. I will explain just one point which will perhaps clear up what you are thinking of—that is, in England to-day the Handley Page Co. are engineering the construction of 18 different contractors; the De Haviland Co. are doing the same with probably more. Our experience and our figures show in England that although they have access—these subcontractors who are constructing parts and complete planes for the different types—to the parent company, also to the work which the Royal Air Force and their technical department can give them, yet the machines turned out by those subcontractors habitually are always less efficient, and we can never get them up to more than—that is, they are 10 per cent less efficient than the machines we make. It is simply due to the training which the people get right from the very time the machine goes into production until it goes out; that is, the training that the people get in the parent company. Now, we have that same condition here. We are 3,000 miles away; we have a certain spirit here back of the producing of these foreign planes which has not been in favor of the success of them, and with that experience in England, it stands to reason we are going to have a far less percentage of efficiency here.

Senator FRELINGHUYSEN. In other words, you mean to say there is a prejudice against the foreign planes?

Mr. WORKMAN. Absolutely.

Senator FRELINGHUYSEN. What have we to substitute for them?

Mr. WORKMAN. Nothing at all.

Senator FRELINGHUYSEN. No other planes designed, are there?

Mr. WORKMAN. There are hopes—or, at least, have been hopes—they could take the foreign plane and improve it and ignore it finally in the hope of developing an American plane. That is what you are doing. If you go down to Dayton and see all the classes of aeroplanes there which they have tried to make grow from the Handley Pages and De Havilands and other types of machines——

The CHAIRMAN. That foreign prejudice is not exclusive in America, is it?

Mr. WORKMAN. No; we admit that.

The CHAIRMAN. We find the same comments by the English upon the French and Italian planes and by the French upon the English and Italian planes, etc.

Mr. WORKMAN. In that respect all countries are alike. Take my own particular work—the Handley Page—the Standard Aircraft crowd there has boasted to my associate, Mr. Allison, that the Hand-

ley Page machine is not any good; it is an expensive machine to make; that the first machine is costing this country \$500,000. I could build a dozen of them for that.

The CHAIRMAN. He made no such statement to us.

Mr. WORKMAN. And in the meantime his engineers and the rest of them have been working on this type trying to make it grow into a four-engine type.

Senator NEW. Mr. Workman, you spoke a moment ago of Mr. Chamberlain?

Mr. WORKMAN. Yes.

Senator NEW. Who is Mr. Chamberlain? Just what relation does he bear to the Handley Page Co.?

Mr. WORKMAN. As I said here in this report, Mr. Chamberlain has been associated with the Handley Page Co. ever since there has been a company. That is, at least since we have been making these big machines.

Senator NEW. Is he an engineer?

Mr. WORKMAN. Yes.

Senator NEW. How did Mr. Chamberlain happen to come to the United States?

Mr. WORKMAN. I was over there last winter, and I made certain suggestions; that if this country wanted really to get Handley Page machines they would have to send some skilled mechanics here to make them; and, taking the matter up with the British Government and Col. Waldon, who was in Paris at that time, it was decided that we should bring a few out here to take charge of the work, and he being the best man we had to be in charge of a technical staff, why we brought him out here—or, at least, I brought him out here—and turned him, together with the other men and myself, over to the production department to look after this work. As I said a little while ago, he, together with the rest of his men, have been ignored.

Senator NEW. You say Mr. Chamberlain has been interfered with and his plans with reference to the manufacture of the Handley Page disregarded?

Mr. WORKMAN. Yes.

Senator NEW. On whose authority has that departure from the Chamberlain plan been made?

Mr. WORKMAN. I think it is a combination of authorities. When you come right down to analyze it. It is coming down here and talking to the production men and convincing them that there are certain changes which should be made, and getting an official order that they go back and make them, regardless of Mr. Chamberlain's advice.

Senator NEW. What effect, if any, do you think that the changes which have been made in the Handley Page machine here have had upon its efficiency?

Mr. WORKMAN. I would rather, as I say, withhold any further comment on that until the machine flies, which we hope to do some time next week. The first effect is in the structural weight.

Senator NEW. Which has been increased?

Mr. WORKMAN. Yes; due to these changes.

Senator NEW. By how much, do you know?

Mr. WORKMAN. I can not say that until the machine is weighed up.

Senator SMITH of Georgia. What engine will we handle the Handley Page with?

Mr. WORKMAN. The Liberty.

The **CHAIRMAN.** The very fact that we use the Liberty motor instead of the English type of motor necessitates some changes in structure, does it not?

Mr. WORKMAN. Only in the framework—the nacelles.

The **CHAIRMAN.** The nacelles; and also because of the increased weight, there must be some changes to bring about the proper equilibrium?

Mr. WORKMAN. No; the only thing you do is to construct a different engine nacelle, and, of course, you are increasing your total weight of the machine; but the machine will carry that weight, but it will reduce your useful load-carrying capacity.

The **CHAIRMAN.** The term “nacelle” is used, is it not, to indicate a supporting platform?

Mr. WORKMAN. Yes; and the framework. I will read what Mr. Chamberlain says himself. This is a letter from Mr. William A. Chamberlain, under date of June 14, regarding himself:

I inclose herewith the promised report upon the present situation, together with the copy of Mr. Page's letter to Sir Henry Fowler you lent me.

The particulars you desire of our work in Dayton were given to a certain extent in my letter to you prior to the order which prevented me having further correspondence with you on the subject, and now that Maj. Ceray has indicated that the line of communication may be reopened I see no reason why the missing particulars should not be supplied.

I gave in my evidence before, you know, that these men were prohibited from having anything to do with me by an official order sent out by Col. Montgomery.

Senator FRELINGHUYSEN. What is Col. Montgomery's name? Is it Col. Montgomery, of the Aircraft Production Board?

Mr. WORKMAN. Yes; the one who was in the Aircraft Board.

As you are aware, it was decided that we should be sent from Washington to McCook field, Dayton, the arrangement being that the first machine should be constructed in the shops of the airplane engineering department under Col. Clark. This scheme was acted upon to a certain extent. An erection shop was prepared for the H. P., but the actual erection was commenced by the production engineering department, to which department we were assigned.

Maj. Gray did his best to push the work forward, but he was too busy getting his organization into working shape to spend much time upon one particular section, and, although Maj. Marmon and his subordinates gave me every assistance, it speedily became evident that top speed would not be made in the shops of the airplane engineering department. This I ascribe partly to the cumbersome system necessitated by the nature of the work of the department and partly because we were interlopers and not part of the organization.

I decided that it would be best to put most effort into the preparatory work necessary before quantity production could be commenced, realizing that sets of parts must be dispatched long before the first machine could be finished if any attempt was to be made to carry out the program.

During February, I believe, it was doubtful whether the machine would be proceeded with or not, and when it was finally decided to continue with the program with all possible speed, arrangements were made with the Standard Co. to take it over.

The question of our immediate future is becoming more urgent. Stapleton Brandt and Croft are still of some use, but their services will be unnecessary in a few weeks' time, whilst Thorn could be dispensed with almost immediately. Personally, as I explained to Col. Allison recently, I do not feel disposed to remain in Elizabeth in enforced idleness whilst other people, no matter how competent, do my work. At the best of times I dislike the idea of doing nothing in return for my salary, and under present circumstances I find it impossible to do so.

It appears to be the desire of the authorities that I should stay here until the first machine is finished, but I think it is time to formulate some plans for a more active future. Accordingly I am contemplating writing Mr. Potter, asking him if there is any further work to follow.

Yours, faithfully,

WM. A. CHAMBERLAIN.

The CHAIRMAN. The program you suggest for the manufacture of Handley Page planes necessarily precludes our manufacture of Capronis, does it not?

Mr. WORKMAN. Well, that is a question, of course.

The CHAIRMAN. To manufacture 10,000 Handley Page machines with a wing spread of 126 feet, at a cost of \$50,000 a plane as a minimum, and the production of 10,000 planes within the time you suggest would make it necessary to abandon, in my judgment, all efforts or attempts to manufacture any other system or style of bombing planes. In other words, we would give to Mr. Handley Page practically the work of constructing all of our bombing planes. It may be the best program—I am not criticizing it—but I am trying to find out or to suggest its effect on other programs, some of which are partly in process of performance.

Mr. WORKMAN. I would not think of stopping anything at all which is now in production. I would not suggest that for a moment, but I will suggest this, in order to clear up the point, that either the Caproni is a good machine or a bad machine and should be produced or should not be produced, and the same thing applies to the Handley Page. Those two bombing machines are both good machines, but it is not possible for either of them to be as good as the other. Either one or the other should be made exclusively. If the Caproni is the better, I am going to get right in behind and make it, if it is within my power to do so. If the Handley Page is the better, I will do the same thing. But I do not think this country should waste any time, money, or material in trying to make both.

The CHAIRMAN. Why not? They are both excellent machines. We need some on the Italian front and we need some on the French front.

Mr. WORKMAN. But it is much easier to tool up and produce 10,000 of the one thing than it is to tool up and try to produce—I am speaking now of the bombing machine—than it is to tool up and try to produce two or three types of bombers.

The CHAIRMAN. If you take that argument and apply it we should continue our program for Capronis, because there are two contracts extant for which all the tools have been made and each of which comprises a production of 500 Capronis.

Mr. WORKMAN. And provided it is not in a state of obsolescence now.

The CHAIRMAN. As I said before, if we are going to stop on every machine because it is obsolete, we will not produce any machine at all. Moreover, I do not think the Caproni is obsolete by any means.

Mr. WORKMAN. I do not think so either, and I am not suggesting that it is or possibly will be, but England, France, and Italy are planning right this minute their program for 1919 production, and 1918 will be finished soon, and they are thinking about 1919, and we should be doing the same, and what I am here proposing is that we should not stop a single thing, whether Liberties, Handley Pages, or

Capronis, but we should make our arrangements for 1919, which is not being done.

The CHAIRMAN. I quite agree with you, and we should make our arrangements as well for 1920.

Senator FRELINGHUYSEN. What is your business? Are you a mechanical engineer?

Mr. WORKMAN. I am not a mechanical engineer. I am only a business man with a lot of experience in this aeroplane work with Mr. Handley Page in England. I have been over there a good many years.

The CHAIRMAN. Mr. Workman represents the Handley Page people, and came over here soon after the war with a full set of plans that he placed at the disposal of the Government, with which nothing has been done except making a great lot of alterations, after which he was obliged to receive back his plans.

Senator NEW. When we were at the Standard Aero Co. plant I questioned Mr. Day somewhat in reference to the Handley Page plans, which had been given by the Government to that company. He said to me that they had received them in very incomplete form. I told him what you had said about having brought to this country complete and perfect plans for the Handley Page machines, and asked him if those plans had ever been delivered to the Standard Aero Co. He said the only thing he could say about it was that such plans that were turned over to them were very incomplete. Now the plans, as I understand it, that you brought over were in the possession of the United States Government?

Mr. WORKMAN. The plans I brought here in December; yes. Everything complete except nine minor drawings, which followed along after I came on here.

Senator NEW. What I want to know is why, if the Government had possession of the complete and perfect plans why incomplete and imperfect ones were turned over to any company that had the making of the Handley Page machine and trusted to them. If there is any explanation for that I should like to hear it.

Mr. WORKMAN. I think if you would question Mr. Day and analyze his answers you would find that what he has to say about the drawings did not apply so much to the original drawings which were handed over to him as it did to the alterations which came along daily, weekly, or monthly through diplomatic and military channels, and those alterations were not Page alterations, they were Royal Air Forces alterations, you see, so that——

Senator NEW. Royal air force?

Mr. WORKMAN. Yes; that is the air board in England. That is, their technical department would make certain changes for a military advantage and then probably take the matter up with Mr. Handley Page, and they would thrash it out as to the value of it, but we would say, "All right, we will apply it to the next 50 or 100, but we will not apply it to this 50." They were handicapped here, I will admit. The alterations, these military air board alterations, were coming through, but they did not know how to apply them, you see, and I think Mr. Day's answers to your questions would apply to that situation more than to the original set of drawings which were handed over.

The suggestion which I have made here and which I am prepared to carry out by bringing Mr. Handley Page and his staff here to assume responsibility of construction will eliminate that, because as every air board alteration in the future is introduced we will have a man leave England every week, if there are any, with that alteration and come here prepared to apply it in a practical way, you see.

Senator SMITH of Georgia. When did you first perfect your plane in England, its manufacture in England?

Mr. WORKMAN. It was perfected, and established, and adopted, and put into production in November, 1915.

Senator SMITH of Georgia. How soon were your plans of the plane offered to the United States?

Mr. WORKMAN. Officially, May 31, last year.

Senator SMITH of Georgia. Did you then have the detailed plans ready for immediate work?

Mr. WORKMAN. I had everything here so I could start in at 8 o'clock any morning you might like and make planes; could have had them made in 90 days' time. It was only a matter of cutting the dies and getting tooled up for it. This all came out, of course, in the evidence of the committee before.

Senator FRELINGHUYSEN. Have you visited the Standard plant at Elizabeth?

Mr. WORKMAN. I have not been there since I got back from England. I had to come right down here.

Senator FRELINGHUYSEN. What do you think of their efficiency and capacity?

Mr. WORKMAN. I can not say at all. I have only been there once, and that just on a Sunday before I left for Europe.

Senator FRELINGHUYSEN. Are you familiar with the financing of the Standard Aircraft Co.?

Mr. WORKMAN. I understand that it is being financed by the Mitsui Co.

Senator FRELINGHUYSEN. What relation does the Mitsui Co. bear to the Japanese Government?

Mr. WORKMAN. They are the paymasters of the Japanese Government throughout the world, its financial agents, and they were also assisting the German secret-service work before the war, acting as paymasters for them.

Senator FRELINGHUYSEN. Are the designs and plans of the super Handley Page available?

Mr. WORKMAN. Not yet.

Senator FRELINGHUYSEN. When will they be?

Mr. WORKMAN. Mr. Page can bring them out here any day he gets word to come.

(Whereupon, at 12 o'clock m., the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JUNE 26, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met in the room of the Committee on Military Affairs, Capitol Building, at 10.30 o'clock a. m., Hon. Charles S. Thomas, presiding.

Present: Senators Thomas (chairman), Reed, Smith of Georgia, New, and Frelinghuysen.

Also present: Maj. H. S. Brown, Maj. Frank E. Smith, and Maj. A. C. Downey.

STATEMENT OF MAJ. A. C. DOWNEY, BUREAU OF AIRCRAFT PRODUCTION, WASHINGTON, D. C.

The CHAIRMAN. Senator New, will you proceed with this examination? You have talked with Maj. Downey.

Senator NEW. What has been your connection with the Signal Corps, Maj. Downey?

Maj. DOWNEY. I was commissioned in the Signal Corps in June, 1917, and handled general law work in connection with contracts for a period of about a month; was then detailed to the Aircraft Production Board as contracting and disbursing officer. At that time it was contemplated that the Aircraft Board would execute the contracts and disburse the funds under them. It was subsequently decided they would allow that function to remain with the Signal Corps, and then I was transferred to the Equipment Division of the Signal Corps, placed in charge of the contract section. My duties there consisted in the execution of orders and contracts for aeroplane material, and the rendering of opinions relative to the legality of payments under those contracts.

Senator NEW. Were you called in conference regarding any legislation affecting the Signal Corps?

Maj. DOWNEY. I was called in conference on legislation relative to the Aircraft Board.

Senator NEW. It was the Aircraft Board to which I had reference.

Maj. DOWNEY. At the time that the Aircraft Board was created, they decided they wanted some legal status. They were merely a board created under the Council of National Defense, and at that time it was contemplated to call upon Congress to legalize their existence. The Aircraft Board then was composed of Gen. Squier, Admiral Taylor, Mr. Coffin, Col. Deeds, Col. Montgomery, Col. Waldon, and Maj. Bolling, who was then in France.

The counsel for the Aircraft Board, Mr. Julian Harris, was instrumental in drafting this legislation. They called me into conference in connection with it, and they drafted various bills in different forms. Their principal difficulty at that time was that they wanted a good deal of authority but very little responsibility, and I think we spent various days there in Mr. Coffin's office over the words "super-vise, control, and direct." They finally came to the conclusion that the English language was not sufficiently adequate to give any board authority without thereby assuming responsibility for their acts, and they subsequently got the legislation through after I left the board.

Senator New. They objected to the responsibility feature of it, did they?

Maj. DOWNEY. Yes; they wanted the Signal Corps to execute the contracts and stand back of them, and the board to be in an advisory capacity and still be able to control the situation. But when the law was finally created, the Aircraft Board assumed at first more or less to control things, and later, about the time they saw the crash coming, the board passed a resolution reaffirming the fact they were only acting in an advisory capacity.

The CHAIRMAN. Just what do you mean, Major, by saying that this was their desire when they saw the crash coming?

Maj. DOWNEY. The Aircraft Board, the individual members and everyone connected with the Signal Corps undoubtedly knew, Senator, several months ago, that there would be an investigation and reports rendered which would not reflect favorably upon the production of aircraft, and, while I do not know, I assume that at that time the Aircraft Board wanted to be more or less in the clear. In other words, this was the psychological moment for them to pass such a resolution if that was their intention.

The CHAIRMAN. That was about what date?

Maj. DOWNEY. I can not give you the date definitely.

The CHAIRMAN. I know, I say about what date?

Maj. DOWNEY. I should say that was about three and a half months ago.

Senator New. As the supervisory contracts and so on, these different types of airplanes and motors, when were they first brought to your attention, what was the first type of airplane that was brought to your notice, and what were the conditions surrounding the letting of contracts for aircraft?

Maj. DOWNEY. The first type of airplane was the JN4, the Curtiss training plane. Contract was let about four or five days after I entered the Signal Corps. That contract provided for 600 planes at a fixed price of \$8,000 per plane, including motors.

Senator New. \$8,000 a plane for the training planes?

Maj. DOWNEY. Yes, sir; that included the motor, the plane ready to fly.

Senator New. What was the second type of plane?

Maj. DOWNEY. The second type was the J1, manufactured by the Standard Aircraft Corporation. That was the training plane that had been previously in use. The first contract that I recall with that company was for a flat price of \$6,500.

The CHAIRMAN. Including the motor?

Maj. DOWNEY. No, sir; that was excluding the motor.

Senator NEW. Were there other types in regular course that were brought to your attention?

Maj. DOWNEY. At the beginning there were various types of planes, none of which were later found to be practicable. At that time they were in what was called the twin hydro stage, they were experimenting with hydroplanes, with twin motors, and it was later discovered that none of these were feasible.

The next type of plane which we contracted for was the De Haviland plane, we contracted for those with the Dayton-Wright Co., and with the Fisher Body Corporation.

The CHAIRMAN. You mean the De Haviland 4?

Maj. DOWNEY. We contracted for both the De Haviland 4 and the De Haviland 9. The engineers were able to get together on the De Haviland 4 prior to the time they were on the De Haviland 9. The DH9 is not yet in production; the DH4 is.

Senator NEW. Did you agree with all matters relating to the letting of those contracts, either for the planes or the motors?

Maj. DOWNEY. Well, personally, I did not approve of all of the provisions of those contracts.

Senator NEW. If you disapproved of them please let us know why, the grounds of your disapproval.

Maj. DOWNEY. Well, I thought that under the cost-plus contracts that the Aircraft Board was approving or recommending the letting of cost-plus contracts containing bogie prices when they did not have sufficient information on which to base those prices. One particular case in which I later had to disagree with the Aircraft Board was in connection with the Willys-Overland contract for 5,000 Ox5 motors. We had entered into a contract which provided that if they made delivery up to a certain schedule they would receive \$2,100 per motor, in the event they fell down on that schedule they would receive \$1,950 per motor, the difference on 5,000 motors amounting to three-quarters of a million dollars. The Willys-Overland Co. fell down on their deliveries, and the Aircraft Board passed a resolution in which they recommended that in consideration of the Willys-Overland Co. maintaining duplicate sets of machinery for upper and lower crank cases during the period of the war, that we would give them the extra bonus of \$150. In other words, that the \$2,100 for their motors would be paid whether they delivered them on schedule or not.

I knew nothing about the value of this heavy machinery, so I consulted with officers who did. They advised me that the value new of this heavy machinery, duplicate sets of it, would cost not to exceed \$25,000. I said, "The Government has not any right, and there is not any consideration for amending a contract where we are to receive \$25,000 worth of machinery and stand to pay out three-quarters of a million dollars."

The Aircraft Board then met several days afterward and they had evidently learned that the Willys-Overland Co. did not possess duplicate sets of heavy machinery, so they amended their resolution to read that in consideration of the Willys-Overland Co. maintaining for the period of the war complete sets of heavy machinery for upper and lower crank cases they would give them this additional money, the complete set, of course, being worth only \$12,500. I refused at

that time to follow the recommendations of the Aircraft Board and stated my position on it, and while there was some considerable argument with various people connected with the program, they saw it was a subject on which they could not press the matter very far. In other words, I was undoubtedly right on it and they dropped it.

They then held a meeting at some later date and tried to put it on the theory that Mr. Willys had invested approximately \$1,000,000 in his additional plant facilities, and that based on that theory there was ample consideration for the execution of a supplemental contract. My answer to that, of course, would be that it was necessary for Mr. Willys to increase his facilities in order to carry out his contract and thus make the profit which he was undoubtedly making on their orders.

Senator New. What individuals did you come in contact with in the letting of the contract?

Maj. DOWNEY. I came in contact with all of the contractors and with Col. Montgomery, Mr. Julian Harris, now Col. Harris, Mr. W. W. Montgomery, jr., and various other attorneys.

Senator New. If any of them were connected with the Government in any way, give us what the connection was.

Maj. DOWNEY. Col. Montgomery was colonel in the Signal Corps and a member of the Aircraft Board, and was finally made chief of the Equipment Division of the Signal Corps.

The CHAIRMAN. He lives where?

Maj. DOWNEY. His home, I believe, is in Philadelphia. He is connected with a banking house in New York.

Senator New. Did you have any disagreements with any of these gentlemen over one of these contracts?

Maj. DOWNEY. Yes, sir; I reached disagreements at times on various clauses on the contracts. I felt that on broad principles on the question of percentage of profit and bogie prices that I was not in a position to set my judgment up against that of the Aircraft Board, but in so far as the contracts were not covered by specific Aircraft Board resolutions then I took exception to various clauses. The Willys-Overland Co. is of course one example of that.

Senator New. If there was anything done by any other person representing either the Government or firms that you would have done otherwise in relation to these contracts, state what that was.

Maj. DOWNEY. The question of these contracts, of course, involves the question of airplane patents, and that is a rather long story. I do not know whether you want to hear that or not.

Senator New. We will get to that a little later. Were there any delays in the closing of any of these contracts; and if so, what was the cause of them? What was the basis for the delay?

Maj. DOWNEY. There were no delays in the closing of the contracts that were material.

Senator New. How did the prices compare, both as to airplanes and motors, with the contracts brought to your knowledge, and how were those prices arrived at?

Maj. DOWNEY. The prices under the contracts were higher. The larger contracts were all on cost plus—cost plus and percentage of profit at either 12½ or 15 per cent. Under that form of contract really the only doubtful question is the fixing of the estimated cost. Those contracts provide that the contractor will receive a fixed profit equal

to either 12½ or 15 per cent of an estimated cost. Then in addition to that if the contractor is able to manufacture the plane or motor for less than the estimated cost, then he will receive 25 per cent of the saving to the Government, and the Government will receive 75 per cent. That, of course, affords a possible opportunity for the contractor to make 20, 30, or 40 per cent profit if the bogie price is fixed too high.

Senator NEW. Do you know of any variation in prices between the various contracts made? If there were any, what was the explanation for them?

Maj. DOWNEY. The contracts were practically uniform with the exception, I believe, of the percentage of profit as between the Dayton-Wright Co. and the Fisher Body Co. The Dayton-Wright Co. receives a profit of 12½ per cent. The Fisher Body Co. receives a profit of 15 per cent on the same plane.

The CHAIRMAN. Why is that difference?

Maj. DOWNEY. Those negotiations were conducted by Col. Montgomery. I was not in on them but his statement to me later was that they were very anxious to get the Fisher Body Co. in production on aeroplanes. They considered that they would eventually be the best source of supply that we had, and that in order to get them to give up their commercial business and invest a considerable amount of money in additional facilities to carry out this contract it was necessary to give them 15 per cent profit.

The CHAIRMAN. That was on what type of machine?

Maj. DOWNEY. That was on the De Haviland 4.

Senator NEW. Were there any supplemental contracts had?

Maj. DOWNEY. Many contracts were supplemented, mostly on immaterial matters, such as changes in delivery dates and authorizing changes in specifications.

Senator NEW. How were the prices arrived at in those contracts?

Maj. DOWNEY. On fixed-price contracts?

Senator NEW. Yes.

Maj. DOWNEY. They were arrived at finally, after our accounting section had made an investigation of costs in the various plants.

Senator NEW. You speak now of variations in contracts there between the Fisher body and the Dayton-Wright. Were there any other variations as between contracts that you know of?

Maj. DOWNEY. I do not recall any others.

Senator NEW. Who were interested—what individuals in these supplemental contracts?

Maj. DOWNEY. Usually the Government. The supplemental contracts were sometimes made necessary in order that we could help finance corporations to enable them to carry on their work. For instance, we might let a contract on a fixed price, the contractor would get all of his material and have most of his parts fabricated, and would reach that stage where he was about ready to deliver units under the contract, and became financially embarrassed. It might be necessary in that case to enter into a supplemental contract providing for partial payments to him. It was necessary at one time in the Curtiss plant, when the production of planes exceeded the production of motors to amend the contract so that they could ship planes to the fields, provided they agreed subsequently to ship the motors there and install them.

Senator NEW. Did you approve of everything done with reference to these supplemental contracts?

Maj. DOWNEY. Yes, sir.

Senator NEW. What were the conditions with reference to increasing facilities, furnished to the contracts, in regard to the erection of plants?

Maj. DOWNEY. That varied in different cases. The general theory of the contracts is that the contractor produces a plant that is equipped with the general standard machinery which is necessary in order to enable him to take a contract; that the Government will furnish such additional facilities as are peculiarly applicable to the type of plane or motor which is to be manufactured. That is the general rule.

We had some special cases where we had to amortize plants. One of such cases was with the Curtiss Co. They constructed what is called the North Elmwood plant. It was done at the request of the Signal Corps. The amount of money expended there was far in excess of what good business judgment would dictate, and we agreed we would amortize that plant. In other words, our contract provides that at the completion of \$30,000,000 worth of work in that plant we will have it appraised by three appraisers and that the Government will pay the Curtiss Co. the difference between the cost of that plant and the appraised value.

The CHAIRMAN. In what way is that appraisement to be made?

Maj. DOWNEY. That is to be made by one appraiser appointed by the Curtiss Co., one appointed by the Signal Corps, and the third appointed by those two.

Senator NEW. What effect has it had upon the actual cost to the Government of air planes and motors?

Maj. DOWNEY. Undoubtedly that represents an increased cost to the Government. I think it is, however, something that is absolutely necessary.

Senator NEW. Have you any reason to believe that depreciation allowances were made to the detriment of the Government's interests?

Maj. DOWNEY. No, sir.

Senator NEW. By whom were these contracts prepared?

Maj. DOWNEY. Most of the large contracts were prepared by Col. Harris or Mr. W. W. Montgomery, or under their direction.

Senator NEW. Were any rejected or disputed by the contract section?

Maj. DOWNEY. Various clauses in those contracts were disputed by the contract section; yes, sir.

Senator NEW. Have you disagreed with any of them? If so, let us know what the extent of that disagreement was.

Maj. DOWNEY. Well, I disagreed on the original draft of the Willys-Overland contract, which I have referred to heretofore. It was drawn under the direction of Col. Harris and they telephoned for me to come down to the Munsey Building one afternoon and sign the contract in a hurry, because Mr. Willys wanted to get out of town.

That contract, as originally drawn, provided a definite schedule of deliveries and provided that the contractor would receive the sum of \$1,950 for delivery of these planes in accordance with that schedule. There was a subsequent clause in that contract which

provided, in substance, that in the event the contractor is able to make deliveries as called for in the preceding schedule he shall receive a bonus of \$150 per motor. To my mind there was no legal consideration for that. He had agreed to deliver those motors in accordance with that schedule for \$1,950, and there was no legal consideration to pay him a bonus of \$150 to do something which he had had already agreed to do. I objected to that, and that led to the final arrangement under which they were to receive the \$2,100 if they lived up to the schedule, and only \$1,950 if they did not. The form in which that contract finally was drafted led up to this controversy with the Willys-Overland Co., which I have already related.

Senator NEW. You refused to sign that first contract, did you?

Maj. DOWNEY. Yes, sir.

Senator NEW. Was any particular pressure brought to bear on you to compel your signature to it?

Maj. DOWNEY. Nothing except the remark of one of the men there that I was throwing a monkey wrench into the machinery. That was, of course, not official.

Senator NEW. Did you negotiate any cross-license agreements?

Maj. DOWNEY. I did not negotiate it; no, sir.

Senator NEW. Did you approve of the action that was eventually taken with reference to the cross-license agreement?

Maj. DOWNEY. I did not approve of it.

Senator NEW. You disapproved of that?

Maj. DOWNEY. I think that as finally worked out the cross-license agreement is in much better shape than it was originally. I still believe they pursued absolutely the wrong principles in reference to airplane patents.

Senator NEW. Will you tell us briefly just what the original cross-license agreement was, and if there was a change made in it, of which you now speak, let us know what that change was.

Maj. DOWNEY. The original cross-license agreement provided that a corporation should be created to be known as the Manufacturers' Aircraft Corporation. The various members of this corporation were to transfer to the corporation patents which they held on aeroplanes, the principal patents being held by the Wright-Martin Co. and by the Curtiss Co.

The agreement provided that each member of the corporation should pay a royalty of \$200 on every air plane which was manufactured into the treasury of the corporation, and the corporation then was to pay out this money at the rate of \$135 per plane to the Wright-Martin Co., \$40 a plane to the Curtiss Co., and retain \$25 per plane in its own treasury. That was to be carried on until such time as the Wright-Martin Co. and the Curtiss Co. had each received \$2,000,000, which meant that while they were receiving an aggregate of \$4,000,000 the Manufacturers' Aircraft Corporation would receive an additional half million dollars, making a total cost to the Government of \$4,500,000.

The CHAIRMAN. That is, I think, the requirement of the agreement as it was finally executed?

Maj. DOWNEY. That was the requirement of the original agreement, Senator. Since that time there has been a supplement which very materially reduces the amount of money.

At that time the Supreme Court, or, rather, the United States district courts, had held that the holder of a patent only had a right of action against the United States, and under this holding he could recover only the fair royalty on account of the infringement.

Senator NEW. Tell us who were interested in the Willys Co.

Maj. DOWNEY. I could not tell you, Senator, except of course Mr. Willys.

Senator NEW. How did this contract compare with similar contracts with other firms?

Maj. DOWNEY. It was in comparison with the practice which had been followed with that type of motor; a very fair contract. In comparison with costs as actually determined, the price was too high.

Senator NEW. Would you say that it was a contract not in conformity with contracts closed with other firms?

Maj. DOWNEY. No, sir; it was in conformity with the existing contracts at that time.

Senator NEW. If this firm received anything in the nature of a special contract, what were the reasons for it, if there was any such?

Maj. DOWNEY. It did not receive any special consideration under that contract.

Senator NEW. With reference to the Dayton Metal Products Co.; who are the members of that company?

Maj. DOWNEY. Do you want me to continue on the cross-license agreement, Senator?

Senator NEW. Yes; we were not through with that.

Maj. DOWNEY. At the time that the original agreement, providing for the payment of \$4,500,000 was entered into, the holder of a patent could only recover under the existing decisions a fair royalty. Since that time the Supreme Court of the United States has reversed the United States district court and held that the remedy is not only against the Government, but against the Government's contractor, and that the holder of the patent can recover not only a fair royalty, but all of the profits which the manufacturer makes. The result of that would be, under our contract where we indemnify and hold harmless a contractor under suit for infringement of patents, that the Government would be liable for vast sums of money.

About this time negotiations were undertaken looking toward a reduction in the amount of royalty which was to be paid under this agreement, and a supplemental cross-license agreement was drawn, which provides that the payments shall not exceed \$2,000,000 to both of these concerns, which has the result of making the total amount to be paid by the Government approximately \$2,300,000 rather than \$4,500,000, resulting in a saving to the Government of \$2,200,000.

The CHAIRMAN. What is the title of that case you referred to in the district court?

Maj. DOWNEY. The title in the lower court was *Marconi v. Simon*.

The circumstances connected with the original cross-license agreement were such that it aroused in my mind a great deal of suspicion as to whether or not it was really an agreement which was in the interest of the Government. At the time that the agreement was negotiated, the Wright-Martin Co. had beaten the Curtiss Co. in two patent suits. The situation as it then existed was that the Wright-Martin patent was held to be the basic patent, and that the Curtiss Co. could not manufacture an airplane without infringing the

Wright patents. The Curtiss Co. was represented in these suits by Judge Crisp of New York. He had been their attorney in those suits and, as we afterwards learned, probably still is in their employment. Judge Crisp came to Washington and acted as the legal advisor of the Government in connection with the negotiations and the institution of this agreement, and in that connection I might say—I do not know whether this ought to go into the record or not—but I might say for Senator Thomas's benefit I understand that you have that up and I read the hearings on it, that you received a communication from, I believe, the secretary of one of those boards in which it was stated to you that Judge Crisp was not in on the negotiation of that agreement; that he was not called in, or was merely called in to put in legal form the result of their conferences. In that connection I might state that I was in on the principal meeting at which this price was negotiated and that Judge Crisp sat right across the table from me and was in on the negotiations.

The CHAIRMAN. That is very important. In that connection, what do you know of one Fish, whose first name I can not recall, and who is said to have been the counsel for the Wright-Martin Co., what do you know of his participation in these negotiations?

Maj. DOWNEY. I understand Mr. Fish was counsel for the Wright-Martin Co., but I do not know in what degree he participated in the institution of this cross-license agreement.

The CHAIRMAN. Did you see him in connection with it at all?

Maj. DOWNEY. I do not recall that I did.

The CHAIRMAN. While we are on that subject, Major, let me ask what, if any, activity had been exercised by those representing the Aircraft Board in inducing or requiring contractors with the Government to take out cross-license agreements?

Maj. DOWNEY. The Aircraft Board itself has not recently tried to get anybody to join the Manufacturers' Aircraft Association. We have ourselves, in view of the fact that this agreement has finally met with approval, endeavored to get our contractors who are operating on a fixed-price basis to join that association and pay the royalty, and the reason for that is this: That for every royalty payment made by one of our contractors on a fixed-price basis, it means that the Government will have less to pay under its cost-plus contracts.

The CHAIRMAN. Just to the contrary was the statement to us by manufacturers. Take, for instance, the Fisher Body Co. They informed this committee that they signed the cross-license agreement and took out a cross-license solely because the authorities in Washington practically insisted upon it, and that so far as they were concerned it was not financially to their benefit, because the royalty required by the cross-license agreement was paid by the Government and calculated in as a part of the cost price.

Maj. DOWNEY. That is correct. Now, whether or not the members of the Aircraft Board requested these companies to join the Manufacturers' Aircraft Association I am not able to state. At the time when this proposition was up I was on the other side of the fence, and so far as I was concerned, I did not want to see them join the Manufacturers' Aircraft Association. I did not think it was an arrangement which was fair to the Government.

Senator NEW. Not only the Fisher Body people tell us that they signed under duress; but they said the same thing at the Standard.

The CHAIRMAN. I used the Fisher Body as an illustration. That was the testimony or the statement to us by the Fisher Body people and the Standard people, the Curtiss people, and the Dayton people.

Senator NEW. Yes.

Maj. DOWNEY. They undoubtedly then endeavored to get these companies to join at that time. So far as my own efforts were concerned, mine were in an entirely different direction.

The CHAIRMAN. Just one other question while we are on that subject. Did the Government authorities at the time of the negotiation of the cross-license agreement know of the pendency of a suit brought by one Montgomery against the Wright-Martin Co. for an accounting, and as claimants of the Wright patents?

Maj. DOWNEY. They did. They were fully advised of that fact.

The CHAIRMAN. And the agreement, then, was negotiated with full knowledge of that claim, all with knowledge of that claim?

Maj. DOWNEY. Whether or not that suit was brought subsequent to the date of the original negotiation or not I am not able to say, but it lay within the power of the Signal Corps to either recognize that agreement or to repudiate it, and at the time when it was up to them to make that decision the Montgomery suit had already been filed.

Senator NEW. Who are the individuals interested in the Dayton Metal Products Co., at Dayton, Ohio?

Maj. DOWNEY. I understand that Mr. Talbott, sr., Mr. Talbott, jr., and Mr. Kettering.

The CHAIRMAN. Any others besides those?

Maj. DOWNEY. None that I know of.

Senator NEW. Have you any information that would lead you to believe that the Government's interests have not been fully cared for in the relations between this company and the Government?

Maj. DOWNEY. I have no such information; no, sir.

Senator NEW. Did you approve of the terms of the contract and the conditions under which it was let? I am referring to the contract between the Government and the Dayton Co.

Maj. DOWNEY. I approved everything with the exception of the bogie price. The bogie price was arrived at by agreement, as I understand, between the Dayton Wright Co. and Col. Montgomery, and was tentatively fixed at \$7,000. I understand that the Dayton Wright Co. at that time addressed a letter to the Signal Corps stating that if manufacture and experience showed that this bogie was too high, they would agree to reduce it. That bogie has been carried through in the supplements since that time, but I have added one provision to the last supplemental contract which provides that upon the completion of 250 of those planes we will negotiate a new bogie price.

Senator NEW. What do you know about the letting of the contract for McCook field?

Maj. DOWNEY. I know nothing about the McCook field contract except that the officials of the Signal Corps decided that Langley field was badly situated from the standpoint of sanitary conditions; from the standpoint of transportation facilities, and on account of the fact that it was far removed from our production centers, and it was decided that Dayton, Ohio, was a central location at which to do this experi-

mental work. I was called in to the conference then in order to straighten out the method of handling finances at this experimental station. There were many technicalities with reference to the handling of Government money, and my connection related only to that degree.

Senator NEW. Who were the parties interested in that?

Maj. DOWNEY. In having the field there?

Senator NEW. Yes; McCook field placed where it is?

Maj. DOWNEY. At this conference Col. Deeds, Col. Waldon, and Col. Vincent, and Maj. Marmon.

The CHAIRMAN. Where does Col. Waldon live?

Maj. DOWNEY. I do not know his home, Senator.

The CHAIRMAN. Is that Maj. Marmon of the Marmon Motor Co.?

Maj. DOWNEY. Yes, sir.

Senator NEW. In your opinion has the interest of the Government been fully safeguarded in the letting of that contract?

Maj. DOWNEY. So far as I know; yes, sir.

Senator NEW. You approved of everything that has been done with reference to McCook field so far as it has been brought to your notice?

Maj. DOWNEY. So far as it has been brought to my knowledge; yes, sir.

Senator NEW. I was going to ask whether at the time of the selection of the McCook field it was disclosed to the authorities, including yourself, that the land comprising McCook field, had been acquired by Col. Deeds and had been by him shortly before then conveyed to the Dayton Metal Products Co.?

Maj. DOWNEY. Officially that was a matter which did not relate to my work. Unofficially I understood that Col. Deeds had arranged the affairs so that there would be no profit for him by reason of the fact that the field was located at Dayton.

The CHAIRMAN. It was at that time understood as a matter of course, was it not, that there would be a large expenditure of public moneys in the way of improvements and structures upon that ground?

Maj. DOWNEY. It was contemplated at that time that there would be probably an expenditure of \$75,000 to \$100,000 a month out there.

The CHAIRMAN. For how many months?

Maj. DOWNEY. Until the end of the war.

The CHAIRMAN. That included expenses of structures to be erected upon the field?

Maj. DOWNEY. Yes, sir. I understand since then that those estimates were a little low and that they have had to expend somewhat more than that.

Senator NEW. As to the Wilbur Wright field, were you familiar with the conditions for the lease of that field?

Maj. DOWNEY. I was not. That was handled by Col. Edgar of the construction division.

Senator NEW. You had nothing to do with that?

Maj. DOWNEY. No, sir.

Senator NEW. You have already stated what your relations were to the finance department. I should like to ask you if you have had any disagreements with any representatives of the Aircraft Board, official disagreements?

Maj. DOWNEY. Nothing, except on the cross-license agreement.

Senator NEW. None other than those to which you have already testified?

Maj. DOWNEY. None at all.

Senator NEW. Most of your disagreements were with Col. Montgomery, I believe?

Maj. DOWNEY. No, I could not say that. With reference to the cross-license agreement, Col. Montgomery did not participate in the original negotiations, and he took the view that the advisory committee on aeronautics having decided the matter, that it was not up to us to reverse them. I took the view that the Signal Corps was chargeable with the expenditure of this money and that regardless of the action of the advisory committee on aeronautics that we should look into the entire situation and make a determination of the question on the facts as we understood them. Col. Montgomery disagreed with that view.

Senator NEW. What is your opinion on the cost to the Government of planes and motors on the cost-plus as against contracts on a fixed-price basis?

Maj. DOWNEY. My opinion is that we will be unable to negotiate on a fixed-price basis on those types of planes and motors which have not been manufactured heretofore in this country, and that we obtained better bargains, at least on our first contract, under the cost-plus basis. I do not mean by that to say that I approve the cost-plus contract. I think it is a necessary evil in many cases.

Senator NEW. Have all the recommendations of the Aircraft Board with respect to the execution of the contracts been followed?

Maj. DOWNEY. The recommendation on the Willys-Overland was not followed.

Senator NEW. That you have stated?

Maj. DOWNEY. I have stated that.

Senator NEW. Were there other instances?

Maj. DOWNEY. No, sir.

Senator NEW. I think, Maj. Downey, that is all, unless Senator Thomas has something further.

The CHAIRMAN. Do you recall a contract given to the Curtis Co. last September for the manufacture, I think, of two or three thousand Spad machines?

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. That contract was abandoned or canceled in the early part of November, was it not?

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. Why was that canceled?

Maj. DOWNEY. That was canceled, as I understand it, because Gen. Pershing cabled that he wanted this Government to enter on the production of two-seated battle planes rather than single seaters.

The CHAIRMAN. More recently a contract has been given to the same company for the manufacture of a similar number of SE5 machines?

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. For a single seated fighter, are they not?

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. Why was not the Spad contract renewed at the time instead of substituting the SE5 type?

Maj. DOWNEY. I assume, Senator, that the engineering people and the people charged with the actual flying of the machines were of the opinion that the SE5 was a better plane than the Spad.

The CHAIRMAN. You have no personal knowledge with regard to that?

Maj. DOWNEY. No personal knowledge; no, sir.

The CHAIRMAN. I have a photographic copy of a contract here, Major, bearing your signature, made on the 15th of October, 1917, with the United States Aircraft Corporation of California, I think for 100 machines.

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. What information had you regarding the equipment of the Aircraft Corporation for the production of the machines at the time the contract was made?

Maj. DOWNEY. I understand that the United States Aircraft Corporation was recommended by their Representatives in Congress as being able to carry out a contract, and that the Signal Corps, while it doubted the ability of this company to perform the contract, was of the opinion that it was desirable to locate a source of supply or sources of supply for aeroplanes on the Pacific coast. That was a small contract.

The CHAIRMAN. What particular Representatives or Senators from California made the recommendations to which you refer?

Maj. DOWNEY. I am not informed in detail as to that, Senator. I was not in on the negotiations, in the first instance.

The CHAIRMAN. My information is that the United States Aircraft Corporation, at the time this contract was awarded, had no plant and no capital, and that immediately after it obtained the contract and for some time thereafter it was engaged in the effort to secure capital, and at one time offered a bonus of \$50,000 for \$200,000 of cash to be used in the construction of plant. Do you know anything about that?

Maj. DOWNEY. I know nothing about the details. I do know that the United States Aircraft Corporation fell down badly on the deliveries under that contract, which you now have, and that that contract was canceled, and that we gave them a supplemental contract for only 50 aeroplanes.

The CHAIRMAN. About when was the subsequent contract made?

Maj. DOWNEY. That was made in February.

The CHAIRMAN. Has the company been able to deliver any machines upon its contract?

Maj. DOWNEY. Yes, sir.

The CHAIRMAN. How many?

Maj. DOWNEY. The company got to the point where they would have completed their contract by the 20th of this month and I understand it was deemed desirable to have them slow up their production to some extent on this type of plane, in order that there would not be a gap in production between the completion of this order and the awarding of any subsequent contract they might be given for training planes.

The CHAIRMAN. Where was their plant located?

Maj. DOWNEY. I think it was Sacramento. I will say this in connection with that company, that originally they had no money and practically no facilities; that they fell down badly on their contract,

and that we canceled it outright; that they then secured the backing of some men of wealth and we gave them then a new contract for 50 planes. That they immediately started in on production and have gone along in fairly good shape since that time.

The CHAIRMAN. In the letting of contracts, who conducts the negotiations? For example, suppose I should come to Washington with a view of securing a contract for the manufacture of aeroplanes for the Government, who is the individual authorized and empowered to negotiate with me for that contract?

Maj. DOWNEY. You mean at the present time or in the past?

The CHAIRMAN. Well, who up to the time of the appointment of Mr. Ryan was the official having authority to negotiate that contract?

Maj. DOWNEY. Up to the time of the appointment of Mr. Ryan there was no one official who conducted all those negotiations. Col. Deeds, Col. Montgomery, sometimes in the past Col. Waldon, just simply anybody who happened to be interested.

The CHAIRMAN. What change, if any, has been made since that time?

Maj. DOWNEY. Since that time we have established a more orderly proceeding. The contractor now comes, in the first instance, to the Production Division and enters into such arrangements there as are necessary and is then sent to the director of purchases.

The CHAIRMAN. Who is at the head of production?

Maj. DOWNEY. Mr. Landon.

The CHAIRMAN. Then he goes where?

Maj. DOWNEY. Then he goes to the director of purchases.

The CHAIRMAN. Who is that?

Maj. DOWNEY. Mr. J. G. Fletcher.

The CHAIRMAN. Is Mr. Fletcher a new appointee or has he been continued?

Maj. DOWNEY. He is a new appointee. He came in shortly after Mr. Potter.

The CHAIRMAN. Then would the proposed contractor be sent anywhere from Mr. Fletcher to some other head?

Maj. DOWNEY. At the present time I am under Mr. Fletcher, and after he has agreed on terms with Mr. Fletcher, then we get together and write up the contract in accordance with that agreement.

The CHAIRMAN. The proceeding then at first is had with the head of the production division; second, with the head of the equipment division, then with yourself?

Maj. DOWNEY. The head of the purchase division?

The CHAIRMAN. Then with yourself?

Maj. DOWNEY. Yes.

The CHAIRMAN. Do these three officials negotiate the contract collectively or separately?

Maj. DOWNEY. Separately, except that I am in on many of the negotiations with Mr. Fletcher, in order that I may get first-hand the agreement that he reaches with them.

The CHAIRMAN. Do you not think it would expedite matters if all three heads mentioned acted collectively?

Maj. DOWNEY. It might, in a way, expedite matters, Senator, but from the standpoint of purchasing it would be bad. The contractor, if advised definitely by the production man that he has the type of plane that the Government must of necessity have, he will then come

to the purchasing agent with the view in mind that he and his company are indispensable to the program, and it will then take considerable more negotiating to get him down in price.

The CHAIRMAN. Is Mr. Montgomery still connected with the aviation force?

Maj. DOWNEY. You mean Col. Montgomery?

The CHAIRMAN. Yes.

Maj. DOWNEY. He is still an officer of the Signal Corps, but has been detailed from his regular duties, and is held now as a witness before the Department of Justice.

The CHAIRMAN. I will ask the same question with regard to Waldon and Deeds.

Maj. DOWNEY. All three of them are in the same status.

The CHAIRMAN. They occupy under Mr. Ryan practically the same positions they occupied before, but are temporarily detailed, so as to testify or appear before the committee, of which Mr. Hughes—or the investigation which Mr. Hughes is conducting?

Maj. DOWNEY. They were detached from their regular duties at about the time Mr. Ryan took charge, and Mr. Ryan has not so far, as I know, assigned them to any duty. They have at the present time no official connection with the Bureau of Aircraft Production.

The CHAIRMAN. Who has succeeded Col. Deeds?

Maj. DOWNEY. Well, Mr. Ryan.

The CHAIRMAN. Who is now performing the duties which Col. Deeds performed prior to that detachment?

Maj. DOWNEY. Mr. Ryan and Mr. Potter.

The CHAIRMAN. And who are performing the duties of Col. Montgomery and Col. Waldon?

Maj. DOWNEY. Col. Waldon was in France the greater part of the time, performing no duties here. Col. Montgomery assumed the duties as Chief of the Equipment Division after Col. Deeds went to the Administration Division of the Signal Corps; Mr. Ryan and Mr. Potter are now performing the duties that were performed up to that time by both Col. Deeds and Col. Montgomery.

Senator NEW. Do you know anything of a contract between the Government and the Engle Aircraft Co.?

Maj. DOWNEY. Yes, sir.

Senator NEW. It has been stated to this committee that there was a contract with the Engle Aircraft Co., which was afterwards canceled. Do you know anything of that?

Maj. DOWNEY. We had a contract with the Engle Aircraft Co. for spare parts on the Curtiss training plane, and some time subsequent to the execution of that contract there was certain criticism on account of the fact that a brother of the Secretary of War was interested in the Engle Co. Mr. Baker then directed that a telegram be sent to the Engle Corporation concerning their contract. That was done. As a matter of fact, of course, a contract with the Government is a binding obligation, the same as with private individuals, and it was impossible to effectually cancel that contract. After that time Mr. Baker, the brother of the Secretary of War, resigned from the Engle Aircraft Co., and it was then decided that in view of that fact it would be all right to reinstate that contract, which was done.

Senator FRELINGHUYSEN. At that time was there not another contract entered into with the Engle Aircraft Co.?

Maj. DOWNEY. Probably about two or three weeks after the cancellation by the Secretary of the first one there was a subsequent contract entered into.

Senator NEW. What ground did the subsequent contract cover?

Maj. DOWNEY. It covered spare parts.

Senator FRELINGHUYSEN. Is Mr. Baker connected in any way with the Engle Aircraft Co. at this time?

Maj. DOWNEY. That is a question that I am unable to answer, Senator.

Senator FRELINGHUYSEN. Did he retain his stock in the company?

Maj. DOWNEY. I assume that he disposed of the stock.

Senator FRELINGHUYSEN. Do you know?

Maj. DOWNEY. I have no detailed information as to whether or not he did. The statement made to me was that Mr. Baker had severed his connection with the Engle Aircraft Co.

Senator FRELINGHUYSEN. Major, was Mr. Baker's brother at any time connected with the Wright-Martin Co., at New Brunswick?

Maj. DOWNEY. I have no knowledge of any connection of his with that company.

Senator FRELINGHUYSEN. He was not employed there, to your knowledge?

Maj. DOWNEY. No, sir.

Senator FRELINGHUYSEN. What was the nature of the contract with the Engle Aircraft Co.—was it all at cost-plus?

Maj. DOWNEY. The original contract with that company was for spare parts for the Curtiss training plane on the basis of a fixed price. Now they have a cost-plus contract for spare parts. They have 500 De Haviland 4's—that is the battle plane that is being manufactured now at Dayton—cost-plus for 500 sets.

Senator FRELINGHUYSEN. Do you know where the Engle Aircraft Co. was organized?

Maj. DOWNEY. I understand it was organized for the purpose of securing work——

Senator FRELINGHUYSEN. Where was it organized?

Maj. DOWNEY. I think under the laws of the State of Ohio.

Senator FRELINGHUYSEN. In Cleveland?

Maj. DOWNEY. I am not informed as to just where.

Senator FRELINGHUYSEN. Do you know the name of the law firm that organized it?

Maj. DOWNEY. No; I do not.

Senator FRELINGHUYSEN. Can you procure that information for us?

Maj. DOWNEY. I can write to the company.

Senator FRELINGHUYSEN. You have stated, Major, that the Secretary of War canceled the contract with the Engle Aircraft Co. At the same time he made a statement, did he not, in regard to it?

Maj. DOWNEY. He made no statement at the time he ordered the contract canceled; at the time that the question was brought up of renewing it, he made the statement that in view of the fact that his brother had now severed all connection with that company, that he deemed it not improper to renew that contract.

Senator FRELINGHUYSEN. I have here a record of the hearings before the committee on Military Affairs, which contains the statement of Secretary Baker, appearing in part 6, page 2252, of the investigation of the War Department, which I put in the record. It states substantially what you have stated.

(The statement referred to is here printed in full, as follows:)

The matter of the Engel Aircraft Co. is of interest only because of the personal relationship between my brother, H. D. Baker, and me. Long before America entered the war my brother told me that he was interested with a Mr. Engel, an airplane expert, in the development of a flying boat. He later told me that they were forming a company to manufacture airplanes. Subsequently and after our entrance into the war, I learned that the company had a contract with the Aircraft Production Board.

I asked Gen. Squier about it, and he was advised that they had a small contract for the manufacture of parts; that the company was excellently equipped and was making good progress, while, on inquiry, I learned that the men in the company with my brother were men of the highest business standing and integrity, and that they had formed the company with a view, primarily, of aiding the Government, and that the contract under which they were proceeding was the usual contract entered into with any persons equipped to furnish supplies of this character. I nevertheless realized that the situation had inevitable embarrassment in it. I thereupon called in Gen. Squier and directed him, in my name, to cancel the contract. At my request Mr. Eugene Myer, jr., went to Cleveland and discussed the matter with the directors and my brother. My brother generously resigned from the company and arranged for the termination of his financial interest in it on the basis of the return to him of his actual cash outlay with interest but without profit, his only compensation being for time actually devoted to the affairs of the company on a reasonable salary basis. His interest in the common stock of the company is returned to the treasury of the company. The company has not begun the delivery of its product. My brother's withdrawal therefore takes place before any actual financial transactions with the Government.

STATEMENT OF MR. FRANK U. ADAMS, NEW YORK TIMES, NEW YORK CITY.

Mr. ADAMS. I have written three articles. My original three articles were for the World. I am on the New York Times only in a special capacity. I am a writer.

Senator THOMAS. You wrote one article, at least, embodying the experience of the Trego Iron Works?

Mr. ADAMS. Yes; I wrote three articles, really, on that.

I will explain how I happened to get the information on which the articles were based. I have a brother, whom I think should be called before your committee if you have time to hear him, Mr. A. C. Adams, who is now with the Hudson Motor Co., and has been with them for a number of years.

Senator REED. What is his address?

Mr. ADAMS. The Hudson Motor Co., Detroit, Mich.

Senator REED. He is there now, is he?

Mr. ADAMS. He is there now; yes, sir. Mr. Trego, who was one of the chief engineers of the Hudson Motor Co., left the Hudson Motor Co. a number of years ago and established the Trego Motor Co., of New Haven, Conn. I do not know whether your committee went there or not.

The CHAIRMAN. We went to New Haven, but did not examine anything there.

Mr. ADAMS. My brother went with him and became production manager of the Trego Motor Co. He called on me when I went to spend a week-end at my residence in Hastings on the Hudson about two months ago or so, and told me a number of things about the difficulties they were having in getting out Liberty motors. He told me a number of what seemed to be very startling facts, and I said to him, "I would like to write that, but if I write it it will surely get you in trouble." He said, "I do not care; you go ahead. Somebody

ought to tell the conditions that prevail at the Trego Motor Co. and how we are handicapped on production." He said they had been unable up to that time to get out a single motor.

The CHAIRMAN. What time was this?

Mr. ADAMS. I can not give the exact date. It was about two months ago. I can tell by reference to my files. I suggested that I go up there, which I did. I went up to the Trego Motor Co. and went through the plant. Briefly, they were handicapped by the fact that changes from the Signal Corps poured in so fast that production, quantity, or otherwise was absolutely impossible. I saw a filing case there filled with the memoranda of these changes. They were coming in at the rate of from 3 to as high as 25 and 30 a day; all sorts of changes; some of them relatively unimportant; some of them extremely important—structural changes, new parts. A part would be changed and a new part ordered, and before production could be started on the new part it would be rejected for some other part.

As nearly as I could estimate from looking over the files in a period of two and one-half months, or maybe three months, there had been over 2,000 changes ordered from the Signal Corps. Of course, as I pointed out in my articles, production under such conditions as that was absolutely impossible. They were working on an order for 500 motors, and of course they would order the proper number of parts, with some spares for breakage for each part; for instance, the number of parts would be as high as 25 to each part, multiplied by 500. In other words, they would produce, in some cases, as high as 22,000 castings, forgings would be ordered, and work would proceed upon them, whereupon, before they were done, a change would come from the Signal Corps discarding them in favor of something else. The result was that up to that time they had not produced a single motor and I heard last week, or 10 days ago, from my brother, that up to the present time the Trego Motor Co. has not yet produced a single Liberty motor which would stand the test imposed by the specifications; in other words, a 50-hour running test in their shops.

Senator NEW. Do you remember just what the Trego Co.'s contract is?

Mr. ADAMS. From what my brother told me, and he should know, the contract was for 500 motors to be delivered——

Senator NEW. Liberty motors?

Mr. ADAMS. Yes; 500 motors to be delivered on the 1st of July, as I understand the contract.

The CHAIRMAN. Do you know when they expect to make any deliveries?

Mr. ADAMS. I do not know. As I say, up to my last visit they have not yet gotten out a motor which would stand the tests.

The CHAIRMAN. Do you know when they received the last order for changes?

Mr. ADAMS. No, I do not; but a long time after I made my exposures they kept on with their changes, and I had my brother get for me a list of the changes for a part of the month, a part of the month I think of April or May. I have that and I will be glad to forward it to your committee.

The CHAIRMAN. Do you know where these changes emanated from?

Mr. ADAMS. They came, so I was informed, from the Detroit office of the Signal Corps. It seems that the Signal Corps has an engineering office in Detroit. I examined the drawings and there did not seem to be any one signature which could be construed as being authoritative. That is, they were not passed upon by any one man. They were signed by different individuals, and I assumed that each draftsman or engineer sent on such changes as he cared to send. I have been unable to ascertain that there was in Detroit any final supervising authority on proposed changes.

The CHAIRMAN. Your mission before this committee is substantially this, is it not, that your brother, who is connected with the Trego Co., can give us some important and substantial information?

Mr. ADAMS. He resigned from there and went back to the Hudson Motor Co.

The CHAIRMAN. In regard to the experience of the Trego Iron Works in and under their contract with the Government for Liberty motors?

Mr. ADAMS. Yes, sir.

If I may suggest to the committee, if you have not already done so, I think it would certainly be a good plan to obtain from that Signal Corps branch in Detroit their own statement and their own record of such changes as they have ordered.

The CHAIRMAN. We expect to do that.

Mr. ADAMS. And I also suggest that be corroborated by the files of the Trego Motor Co. and other concerns to which these orders were sent. I assumed, of course, in my article, and still assume, those changes must have been uniform, because they were working on standardized production.

Senator NEW. Yes; I think it may be taken for granted that these changes sent to the Trego Co. were the same as sent to all the other manufacturers.

The CHAIRMAN. If they are not uniform they are not warranted. We will follow your suggestion.

Mr. ADAMS. My testimony is relatively worthless, except I received information from my brother, Mr. Adams, now of the Hudson Motor Co. in Detroit.

STATEMENT OF MAJ. A. C. DOWNEY—Resumed.

The CHAIRMAN. I show you a photostatic copy of a telegram, which has evidently been sent by Gen. Squier.

Maj. DOWNEY. Yes; that is a copy of the telegram canceling that original contract.

Senator FRELINGHUYSEN. To the Engle Aircraft Corporation?

Maj. DOWNEY. Yes, sir.

Senator FRELINGHUYSEN. I will put that copy in the record.

(The telegram referred to is here printed in full as follows:)

WASHINGTON, January 21, 1918.

ENGEL AIRCRAFT CORPORATION,
Niles, Ohio:

By direction Secretary of War your contract for aircraft is hereby canceled.

SQUIER,
Major General, Chief Signal Officer Army.

(Copy sent to the Secretary of War.)

Senator FRELINGHUYSEN. I read into the record a letter from the Secretary of War, which is a photographic copy sent me by Col. Deeds, of the Aircraft Production Board. [Reading:]

WAR DEPARTMENT,
Washington, D. C., February 5, 1918.

Memorandum for Gen. Squier.

In the matter of contract of the Engle Aircraft Co.

On the 21st of January I directed you by telegraph to cancel the contract of the Engle Aircraft Co. Since that time an investigation has been had which I am advised shows this company to be well equipped and engaged in doing good work. Maj. Shipley, the officer in charge of production in Cleveland, Ohio, has reported that everything from the production department of the Engle Co. is satisfactory, and that in his opinion it would be a great mistake to cancel the contract. The fact that my brother was associated with the company gave rise to embarrassment in the situation. My brother has now withdrawn from the company, separated himself entirely from it, and there is therefore no reason why the contract should not be reestablished and this company treated like any other in the work it has undertaken to do for the Government.

NEWTON D. BAKER,
Secretary of War.

Have you ever seen a copy of that letter?

Maj. DOWNEY. Yes; I saw a copy of that, Senator.

Senator FRELINGHUYSEN. The following is a copy of a letter that I addressed to Col. E. A. Deeds. [Reading:]

FEBRUARY 18, 1918.

Col. E. A. DEEDS,

Aircraft Production Board, War Department.

MY DEAR COL. DEEDS: In the testimony before the Military Affairs Committee it was stated in relation to the contract of Mr. H. D. Baker, president of the Engle Aircraft Co., with the Aircraft Production Board, that the Secretary of War had directed that this contract be canceled. I am informed authoritatively to-day that the Aircraft Production Board wrote a letter to the Secretary of War that the contract be reinstated, and that the Secretary of War replied directing this.

I am writing this for the chairman of the Military Affairs Committee asking that certified copies of this correspondence be forwarded to me to be incorporated in the record, and that this action on your part and the Secretary of War's part be confirmed in order that the record may be complete on this inquiry.

Very truly, yours,

J. S. FRELINGHUYSEN,
United States Senator.

I read into the record a telegram as follows. [Reading:]

WAR DEPARTMENT,
February 20, 1918.

The ENGLE AIRCRAFT CORPORATION,

Niles, Ohio:

By direction of the Secretary of War, your contract for aircraft is hereby reinstated.

SALTZMAN,
Brigadier General, Acting Chief Signal Officer, Army.

(Copy for Capt. Ward, Col. Montgomery's office.)

I will show you the telegram and ask you if that is a true copy?

Maj. DOWNEY. Yes, sir.

Senator FRELINGHUYSEN. I will also read in the record a letter from Col. E. A. Deeds, in reply to my letter of February 18, as follows. [Reading:]

MARCH 2, 1918.

MY DEAR SENATOR: Your letter of February 28 was received this morning. The contract with the Engle Aircraft Co. was canceled in accordance with the attached copy of wire which was sent to that company upon instructions from the Secretary of War. This contract was reinstated in accordance with the attached photostatic copy of wire which was sent to the Engle Co. upon instructions from the Secretary of War.

contained in his memorandum of February 5, photostatic copy of which is attached. I am advised that the Aircraft Board did not write a letter to the Secretary asking that the contract be reinstated.

I trust that this information will prove sufficient to complete your records.

Very truly, yours,

E. A. DEEDS,
Colonel, Signal Corps.

HON. J. S. FRELINGHUYSEN.

You stated, Major, that that contract was never legally canceled, and could not be under its terms?

Maj. DOWNEY. Any Government contract, of course, may be canceled, but the Government thereby assumes a liability for breach of its agreement; and my statement, while it may be not literally true, is undoubtedly correct. If the Government had attempted finally to cancel that contract, it would have been necessary to reimburse the Engle Co. for not only their expense in connection with it but probably prospective profits.

Senator FRELINGHUYSEN. Then the contract was not canceled?

Maj. DOWNEY. It was, in so far as the Secretary of War could cancel it. In other words, he did everything that it was possible for him to do, but it was impossible for anybody to remove that legal situation that existed.

Senator FRELINGHUYSEN. I do not understand you. It was not canceled because of the fact that it would have subjected the Government to unnecessary expense, or added expense, by reason of its cancellation?

Maj. DOWNEY. No; what I mean is this, that it would be impossible for the Government to cancel that contract and free itself from all liability to make a payment to the Engle Aircraft Co. The Secretary of War did cancel the contract, but if it had remained in that status the Government would then have had to pay the Engle Aircraft Co. not only whatever expenditures they had incurred, but undoubtedly would have had to reimburse them for any prospective profits they would have made.

Senator FRELINGHUYSEN. Then there was no suspension in production?

Maj. DOWNEY. I think there was suspension in production for a few days. I know that the Engle people came down, this Mr. Sales who took Mr. Baker's place, came down to see me about it, and they were up in the air as to what their legal rights were in the matter, and it was at that time that the Secretary of War came through and instructed us to go ahead and reinstate it. There was, I think, some delay in the production.

Senator FRELINGHUYSEN. Do you know Mr. H. D. Baker?

Maj. DOWNEY. I have met him, that is all.

Senator FRELINGHUYSEN. Did you negotiate this contract with the Engle Aircraft Co.?

Maj. DOWNEY. I did not.

Senator FRELINGHUYSEN. You had nothing to do with it?

Maj. DOWNEY. No, sir. The method by which that first contract was negotiated was this: The Government accountants had gone into the Curtiss Co.'s factory and made a determination of cost on the individual parts of that plane. He then took those costs and told various contractors that was the amount we would pay them for spare parts. The Engle Co. and the Rubay Co. and several other

companies then took contracts, all on the same basis, in so far as those spare parts were concerned.

Senator FRELINGHUYSEN. At what time of the year was that, what was the date?

Maj. DOWNEY. October 25, 1917.

Senator FRELINGHUYSEN. Was the Engle Aircraft Co. in position to manufacture spare parts at that time?

Maj. DOWNEY. I assume they were like all of these other companies: they had a plant and the machinery, a power plant, and everything that was necessary. They did not, of course, have the special tools and fixtures that are necessary for a particular type of aeroplane.

Senator FRELINGHUYSEN. Were there other facilities in the country that were equipped at that time to manufacture that could have been utilized?

Maj. DOWNEY. There was at that time no company that could immediately jump into production of airplanes. It requires a tooling up, Senator; possibly sometimes from three to four months.

Senator FRELINGHUYSEN. I read into the record a letter to Col. Deeds, by me, of date April 11, 1918, as follows [reading]:

Col. DEEDS,

Aircraft Production Board, War Department.

MY DEAR COL. DEEDS: Referring to your letter of March 2, in which you inclosed me copy of a telegram sent by direction of the Secretary of War to the Engle Aircraft Co., dated January 21, canceling the contract, and another copy, dated February 20, sent by the direction of the Secretary of War reinstating said contract; also a copy of memorandum for Gen. Squier, signed by Newton D. Baker, Secretary of War, dated February 5. I should like to know whether any settlement was made with Mr. H. D. Baker, president of the company, at the time of his retirement from the company. I have been informed that a cash settlement was made, and I should like to know whether it was made by the Signal Corps, United States Army, or the company, and whether the department is informed of the terms of this settlement. If so, what they were.

I have been informed also that further contracts have been entered into by the Engle Aircraft Co. If that is so, may I ask for the dates of the contracts and the amounts of them?

I read in the record the following letter, dated April 13, 1918 [reading]:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
ADMINISTRATION DIVISION,
Washington, D. C.

Hon. J. S. FRELINGHUYSEN,
United States Senate, Washington, D. C.

MY DEAR SENATOR FRELINGHUYSEN: Your letter of April 11, 1918, in regard to cancellation and reinstatement of the Engle Aircraft Co.'s contracts was received in this morning's mail. In answer to your question as to whether any cash settlement was made to Mr. H. D. Baker, the president of this company, at the time of his retirement, I can say that the Signal Corps made no cash settlement with him. I have no information available as to what settlement, if any, the Engle Aircraft Co. made with Mr. Baker upon his retirement. The Signal Corps have entered into the following contracts with the Engle Aircraft Co.:

October 26, 700 sets, spare parts, for JN4-D aeroplanes, \$585,077.50.

November 3, miscellaneous spare parts for aeroplanes, \$14,962.50.

January 17, 200 sets spare parts for JN4-D aeroplanes, \$172,065.

February 14, 200 sets spare parts for JN4-L aeroplanes, \$163,965.

February 4, 100 sets spare parts for JN4-D aeroplanes, \$86,595.

March 15, 500 sets spare parts for DH4 aeroplanes, contract let on cost-plus basis (estimated cost, \$2,275,000).

Very truly, yours,

E. A. DEEDS,
Colonel, Signal Corps.

Are those all of the contracts that the Engle Aircraft Co. has received?

Maj. DOWNEY. Yes, sir.

Senator FRELINGHUYSEN. Were you familiar with the organization of the Engle Aircraft Co.?

Maj. DOWNEY. No, sir; I was not. The first I knew of the Engle Aircraft Corporation was when the Aircraft Board sent Mr. Baker and another gentleman, who was with him, down to my office with the statement that he was to get a contract, and the price and everything which they were to receive.

Senator FRELINGHUYSEN. Did Col. Deeds send him to your office?

Maj. DOWNEY. No, he was sent probably from the accounts section. He had been down to Mr. Gee in our accounts section. He was the man who had been determining the cost of spares for JN4-D planes, and when they had agreed on the prices then they came up to see me about the contract.

Senator FRELINGHUYSEN. Who accompanied Mr. Baker on that visit?

Maj. DOWNEY. I do not recall whether Mr. Gee came up to my office with him or not, but he had come from Mr. Gee's office.

Senator FRELINGHUYSEN. Did you see a copy of a circular that was circulated by a firm of bankers in Cleveland, soliciting subscriptions to the stock of the Engle Aircraft Co.?

Maj. DOWNEY. I did.

Senator FRELINGHUYSEN. Do you recall the purport of that statement?

Maj. DOWNEY. Well, the purport of that statement was that the Engle Aircraft Co. had received orders for spare parts for aeroplanes, and that there were good prospects of future orders, and went on to state that the spare-parts game was the most profitable of any of them.

Senator FRELINGHUYSEN. Did it make the statement that they were to receive \$5,000,000 worth of orders?

Maj. DOWNEY. I do not recall that, Senator. It has been a considerable time since I saw that.

Senator FRELINGHUYSEN. Can you procure a copy of that circular?

Maj. DOWNEY. I will use my best efforts to do so. I have not a copy myself.

STATEMENT OF MAJ. H. S. BROWN, BUREAU OF AIRCRAFT PRODUCTION, WASHINGTON, D. C.

Senator NEW. What position do you occupy in the Bureau of Aircraft Production?

Maj. BROWN. I am the present Chief of the Finance Division.

Senator NEW. Are you a civilian officer?

Maj. BROWN. Yes, sir.

Senator NEW. What was your business connection prior to entering the service?

Maj. BROWN. For 13 years prior to entering the service I have been in the business of operating and financing public-utility corporations in various parts of the United States. For the last seven years of that time I have been a member of the firm of H. D. Walbridge & Co., 14 Wall Street, New York City. My experience with H. D. Walbridge

& Co. was that of a supervisor of operating, financing, and purchasing. I was an officer and director of the public-utility companies; traveled around the country in connection with the organization of their operating forces, the direction of their accounting procedure, and the preparation of their accounting forms; analyzed their reports, and in general had supervision of their finances. As purchasing agent, I did all of their general purchasing of material and equipment, executed contracts therefor and administered them. I also had supervision of and prepared their mortgages and directed all of their corporate affairs. It was a character of work in organization and management that is very similar to the proposition with which we are confronted in the Signal Corps in having members of our financial organization in different units scattered throughout the country, requiring centralized direction and uniformity of policy.

Senator NEW. And that is the experience that you had in private business life which qualifies you for your present position, I presume?

Maj. BROWN. Yes, sir.

Senator NEW. How long have you been in the Government service?

Maj. BROWN. I came down here first the latter part of September, and, unofficially, worked as a civilian during the early part of October until I was commissioned a captain in the Signal Officers' Reserve Corps on October 31, 1917. I was commissioned a major in the Signal Corps (temporary) on December 22, 1917.

Senator NEW. What prompted you to enter the service?

Maj. BROWN. I attended the officers' training camp at Plattsburg in June, 1916. I enlisted again in the officers' training camp, which was intended to start on the 1st of June, 1917, but which was set forward, owing to the declaration of war, to the 14th of May. I could not close up my business in time to go to that camp. I then tried to get in the second officers' training camp and spent a whole Saturday afternoon (the last day of enlistment) in line at West Forty-fourth Street, New York City, and was so far back in the line that they closed the offices before I was reached. I was disappointed, and expressed my disappointment to Col. Wolff, who was then a civilian, and a former business associate of mine, and he evidently remembered me, because later when he was down here in Washington with Col. M. W. Thompson attempting to organize the Finance Department of the Signal Corps I received a letter from him asking me if I would not come down and help. Pursuant to that request I came down, looked the situation over, and agreed to come.

Senator NEW. Who is Col. M. W. Thompson?

Maj. BROWN. Col. Thompson is the first chief of the Finance Department of the Signal Corps. In business life he is a member of the firm of Thompson & Black, located at 14 Wall Street. They are certified public accountants, and I believe Col. Thompson came down here at the request of Col. R. L. Montgomery to act as Col. Montgomery's financial and accounting advisor in connection with the Aircraft Board situation at that time.

Senator NEW. Is he still with the Finance Department?

Maj. BROWN. No, sir; he is now chairman, I believe, of the War-Credits Board.

Senator NEW. Why did he leave the Finance Department?

Maj. BROWN. He accepted membership (I believe he was appointed by the Secretary of War) on the War-Credits Board, and that took

so much of his time that Col. Montgomery did not feel that the Signal Corps' interests were being best served by having him remain as chief of the Finance Division, and Col. Thompson, by arrangement with Col. Montgomery, retired from the Finance Division, and has devoted his entire time to the War-Credits Board.

Senator NEW. Who is Col. Wolff?

Maj. BROWN. Col. Wolff is a former employee of Hodenpyl, Hardy & Co., 14 Wall Street, New York City, public utility bankers and operators. Col. Wolff has held with that organization a position similar to the one I have described for myself, in fact, for seven years we were associated in business as employees of the same organization, eight or more years ago.

Senator NEW. Tell us of the functions of the Finance Division.

Maj. BROWN. Our effort in the organization of the Finance Division has been to run it somewhat on corporate lines. We have created departments separately organized to take care of its distinctly separate functions. The chiefs of those respective departments form a Finance Division Council, which really administers all of the functions and directs the policies of the Finance Division.

There are some specific functions that we delegate to subcommittees, called boards. We have two such boards, one a Rulings Board, which acts upon questions relating to the interpretation of contracts. Another an Adjustments Board, which acts upon questions relating to adjustments or settlements under contracts, and it was created in order to give a legal status to such adjustments as the board may be called upon to make.

We have a pamphlet giving the detailed organization charts and the specific functions and routines of our entire division, and its several departments and sections, but for your purpose, perhaps, General Memorandum, No. 30, dated June 24, 1918, issued by Mr. W. C. Potter, assistant director of aircraft production, would answer.

Senator NEW. Explain briefly what that is and then give it to the stenographer for the record.

(The document referred to is here printed in full as follows:)

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
FOURTH STREET AND MISSOURI AVENUE NW.,
Washington, D. C., June 24, 1918.

General Memorandum No. 30.

1. There is hereby established in the Bureau of Aircraft Production a Finance Division, which will have charge of—

(a) General administration of all financial matters of the Bureau of Aircraft Production, including keeping the books of account and statistical records of appropriations and advances to contractors through War Credits Board.

(b) The financial administration of orders and contracts, including the propriety of expenditures and the approval and determination of prices and costs, adjustments and settlements, under cost-plus contracts and subcontracts thereunder, after such orders and contracts have been placed or executed by the Purchase, Storage, and Traffic Division.

(c) Accounting and obtaining reimbursement for all materials and supplies purchased for sale to others, under the act of October 6, 1917, including the direction and auditing of the accounts of the Spruce Production Division.

(d) Identifying, taking title to, and disposing of property acquired, including facilities, Government-purchased units, and materials delivered to plants of cost-plus contractors, and the disposition of obsolete machinery, equipment, materials, scrap, etc., pursuant to the provisions of the act of May 10, 1918.

(e) Disbursements under all orders and contracts, including the issuance of authorities to disbursing officers and the administrative examination of their accounts.

(f) Financial investigations, reports, and estimates, for the use of other divisions of the Bureau of Aircraft Production.

(g) The commissioned, enlisted, and civilian personnel employed for or assigned to the Finance Division.

(h) General administration of the finances of the Chief Signal Officer and the Director of Military Aeronautics until a transfer thereof can be effected.

2. Pursuant to the above general outline, the Finance Division will furnish to the other divisions of the Bureau of Aircraft Production such detailed statement of the functions of its several departments as may be necessary to avoid duplication and secure better cooperation.

3. The other divisions of the Bureau of Aircraft Production will furnish to the Finance Division any information, records, etc., called for, in order that this division may successfully perform the functions intrusted to it.

By order of Mr. Ryan:

W. C. POTTER,
Assistant Director Aircraft Production.

Maj. BROWN. General Memorandum No. 30 is a statement of the general functions of the finance division of the Bureau of Aircraft Production. It is published to all the other divisions of the bureau and to their respective departments and sections, and their personnel for their information and guidance.

Senator NEW. Is that the first definite establishment of the functions of the finance division?

Maj. BROWN. Yes, sir.

Senator NEW. When was that issued?

Maj. BROWN. June 24, 1918, Monday of this week.

Senator NEW. Have the functions of the other departments of the Aircraft Production Bureau been similarly fixed?

Maj. BROWN. No, sir; they have not. Failure to do so in the past has resulted in quite a little duplication of work between the various divisions, and some confusion as to responsibility and authority.

Senator NEW. Are the functions of the finance division the same now as they have been from the first?

Maj. BROWN. No, sir; we have gone through a development stage. We have found a certain amount and character of work to be done in functioning under the cost-plus contracts, and we have built up an organization and created a personnel to take care of that work. We have not been directed by our superior officers at any time as to what to do and what not to do, consequently we have perhaps reached out and done more than a finance division in a well-organized body would be permitted to do.

The chief instance of our perhaps overreaching was in the matter of the execution of contracts. Our theory was that the contracting officer should be an intervening party between the purchasing agent and the contractor for the administration of contracts. I have had several conferences with Mr. Potter on the subject and he disagrees. He feels that the contracting officer should be subordinate to the purchasing agent. His belief is that a purchasing agent should have the power to negotiate and complete his contract up to and including the point of execution, and on that theory he transferred our contract section, which was a unit headed by Maj. Downey with a large commissioned and civilian personnel, to a newly-created division of the Bureau of Aircraft Production, called purchase, storage, and traffic division, headed by Mr. Fletcher, a civilian, who has combined all the former purchasing activities of the various departments of the Bureau of Aircraft Production, the old equipment division, under one head.

As a matter of fact, the new arrangement will work perfectly well, because of the close harmony between Maj. Downey and Mr. Fletcher. It is another proposition of an organization being wrong in theory, in my opinion, but working satisfactorily and efficiently because of the personnel.

The CHAIRMAN. What is Mr. Fletcher's business in civil life?

Maj. BROWN. I have heard that he was president of the Riter-Conley Manufacturing Co. in Pittsburgh, which was sold out, and Mr. Fletcher since that time has been in the mining business. That is my information, sir.

The CHAIRMAN. You say it was sold out. You mean it failed?

Maj. BROWN. No; I understand it was bought out by a larger organization and went into a combination. I forget the name.

Senator NEW. What is the personnel of the finance division?

Maj. BROWN. Our commissioned personnel consists of two majors, 18 captains, 68 first lieutenants, 57 second lieutenants, a total of 145 commissioned officers. We have besides that 442 enlisted men and 578 civilians, so that our total personnel consists of 1,165 persons, divided, 368 in Washington and 797 in the field, located at the district offices of the Bureau of Aircraft Production and at the various contractors' plants.

Senator NEW. Is the present personnel sufficient to do the work?

Maj. BROWN. It is inadequate for our present needs by over 350 persons. That 350 ought to consist of, perhaps, 125 commissioned officers and the remainder either civilians or enlisted men. We would much prefer enlisted men because of our better control of them.

Senator NEW. Who is in charge of the field organization?

Maj. BROWN. Maj. Frank E. Smith is the executive officer in the field for the finance division, and he will appear before you and tell of his work. His assistant is Capt. Frank E. Haag, a former partner of mine in the public utility business.

Senator NEW. Complaint has been made to us that the representatives of the Finance Division do not cooperate with the contractor and that they impede production. The Standard Aircraft people, over at Elizabeth, for instance, made that complaint.

The CHAIRMAN. What have you to say about that?

Maj. BROWN. I had a conference in the Standard Aircraft Co.'s plant at Elizabeth on Friday two weeks ago, at which we took up various complaints.

Senator NEW. You say you had a conference and "we took up complaints." Who were in that conference?

Maj. BROWN. At the conference representing the Bureau of Aircraft Production were Capt. F. E. Haag, the head of our accounts department, our accounting and approvals officers at the Standard Aircraft Co.'s plant, and myself; also Maj. C. B. Rose, representing the production department of the Bureau of Aircraft Production, who has been stationed at the Standard Aircraft Co.'s plant in order to expedite production and assist them, stationed there, I believe, by direction of Lieut. Col. Mixter. Representing the Standard Aircraft Corporation were Messrs. Mingle, president; Finkelstein, vice president; and Kettley, auditor.

I wrote Mr. Mingle a letter concerning the points which were discussed, and I will refer to it here briefly to show you the character of complaints which they have made as to our lack of cooperation.

Mr. Mingle's chief complaint is the fact that we have demanded from the Standard Aircraft Corporation, as from all other contractors, reimbursement for over \$700,000 of materials furnished to him by the Government, consisting of lumber, linen, instruments, dope, etc. This indebtedness has accumulated over a period of months, and a few weeks ago we notified Mr. Mingle that we would expect payment. He expressed surprise, stating that he never expected to have to pay for these materials until the complete planes were delivered. We explained to him that the Signal Corps, in furnishing him materials for the construction of planes, had exactly the same status as a commercial vendor and expected payment of its invoices in accordance with commercial practice.

Senator New. What did his indebtedness to the Signal Corps amount to at that time?

Maj. BROWN. It amounted to \$702,000 at that time, and our demand for payment pressed Mr. Mingle's financial facilities. He had not a sufficient working capital. As Manager Rose told us, and we know it also from the various letters which we get from commercial creditors that come in to us and ask us if we can expedite payment, that the Standard Aircraft Corporation has not paid many of its bills since back in December and January. We had a conference three weeks ago with Mr. Mingle at which he agreed that he would go out and borrow \$1,500,000. He said he had plenty of financial backing—in fact, he repeatedly refers to the fact that the Mitsuis of Japan are the controlling interest in his company—and that with the \$1,500,000 he borrowed he would pay the \$700,000 he owed the Signal Corps, and would use the balance to pay commercial creditors.

We have reason to believe, and Maj. Rose, with whom I talked this morning, confirms it, that he has not paid his commercial creditors; further, he has paid out of over \$700,000 that he owed us only about \$565,000, and that payment was made by our withholding his vouchers to the Government for the Government's indebtedness to him, until his company made part payments to us. He made that reimbursement of \$565,000 to us in two payments. I had held up in order to cover his Government indebtedness, \$502,000 of vouchers due the Standard under his promise made two weeks prior that he would reimburse us. He came down here and insisted we must pay the \$502,000. He bluffed along all day about being willing to exchange checks, and after a four or five hour conference, at half past four in the afternoon, when I offered to exchange checks, he picked up his papers, said the conference was over, "I won't do it." He then went upstairs to Mr. Kellogg's office and I followed to report to Mr. Potter the result of the conference. Mr. Kellogg asked me to come into his office, where I found Mr. Mingle, and then Mr. Mingle said that I had refused to exchange checks. Having him there in the presence of several other gentlemen I said, "Mr. Mingle, are you still willing to exchange checks?" He said, "Yes; but I will only pay you for the amount of stuff your own accountant says is actually delivered out of this \$700,000." He said it was \$465,000. I took advantage of the opportunity to get that \$465,000. He wrote out and gave me a check for \$465,000, and I gave him the Government's check for \$502,000.

Later, this past week, after my conference with him in his office two weeks ago, Mr. Finkelstein called up from Elizabeth, N. J., and said, "You are still holding up our vouchers, Maj. Brown." I said, "Yes, sir; because you still owe us a balance and I want to get this account adjusted with you." He said, "We are badly in need of funds for our pay roll; can you not send us the money and I will promise to pay you the entire amount of that indebtedness by the 1st of July?" I replied that I would go out to the end of the limb with him, and I would split the difference; that we owed him \$264,900 in vouchers I was holding up and if he would send me a check for \$125,000 and wire me he was mailing it and that he would make payment of the balance by July 1, 1918, I would release the \$264,900 which the Government owed him. He sent me such a telegram. I released the check and it reached New York Saturday morning. His telegram evidently was not complied with because his \$100,000 check was not received by me until Tuesday morning, evidencing the fact that he probably held up the remittance of his \$100,000 until he got our \$269,000 and then sent the \$100,000.

Senator NEW. Instead of \$125,000?

Maj. BROWN. Pardon me, I agreed afterward, when he said that a deduction of \$125,000 would leave him too little; that he could send me \$100,000. But in mailing that check he attached a condition in the letter. He said, "This is conditional upon the expeditious passage of our vouchers by your accounting and approvals officers in our plant."

Now, expeditious passage of vouchers from Mr. Mingle's standpoint consists of our passing immediately everything he puts before our officers. He has no accounting system; he has four contracts with the Signal Corps and one with the Navy. He can not distribute his labor and his materials; he has no store-keeping system and has not segregated his materials. He sends his vouchers to our approvals officers for so much lumber or so much material at such prices and such an amount, and expects our officers to pass such vouchers for the Government's reimbursement to him. Our accounting and approvals officers are put to the necessity of going out into Mr. Mingle's plant to locate this material in order to know that it is there, and then to have our property officers take physical charge of it and see that it is issued to the respective contracts, and not issued to some other contract, perhaps to a Navy contract, perhaps used in some construction work that Mr. Mingle is doing in his own plant.

The CHAIRMAN. Do you pay for the Navy contracts?

Maj. BROWN. No, they pay themselves. Mr. Mingle resents our efforts to check up this material. Mr. Finkelstein stated to me in a very high-handed manner—

We are children of the Government; we look to the Government to protect us; we are ignorant, we are inexperienced; you know the difficulties we have been up against; you know we have received all this material, or that it has come into our plant, but just because we can not locate it after it gets here and just because we can not specify what it goes to this contract or that is no reason why your accounting officer should hold up our vouchers.

As a result of Mr. Mingle's lack of an accounting system and a storekeeping system, we have in his plant to-day more than twice as many Government representatives than we have in any other plant. Yet he is one of the smaller contractors. That large force is necessitated by the fact that we have to check up and have had to check

up, for Mr. Mingle, a lot of details that his own organization should have checked up and that he is not yet in a position to check up.

Further, away back last fall, when Mr. Mingle got his first cost-plus contract, he had on hand a large stock of materials and fabricated parts which he had gone out in the market and bought at various prices, not knowing that the Government's policy was going to be to step in and control some of these purchases, and not having any information as to bills of material or specifications of the planes to be built; he overbought, and he bought some materials not applicable and he used up practically all his working capital in that way. In order to give relief when he made his first cost-plus contract, we made Mr. Mingle large payments on estimated vouchers, as our cost-plus contract permits us to do.

We have been checking up those estimated payments ever since with the large organization that we are maintaining there, checking up the actual materials against the bill of materials, and against the specifications, and we are at a point now where we are within two or three weeks of completing the settlement of the old cost-plus contract but in the meantime we have had to hold back \$160,000 of vouchers because we made overpayments on estimated vouchers that would necessitate our holding out that amount to balance the account.

Mr. Mingle now says we ought to pay that \$160,000; that we ought not to hold it up, but we have got to do so.

Senator FRELINGHUYSEN. Have you a system by which you investigate the financial condition of corporations that have contracts?

Maj. BROWN. We do not investigate their financial condition prior to the granting of a contract, but after a contract is let, particularly if it involves any advance to the contractor through the War Credits Board, we obtain a balance sheet and do keep an eye on their expenditure of Government funds, and in that way acquire a limited knowledge of their financial condition.

Senator NEW. Is that all with reference to the Standard?

Maj. BROWN. I would just like to add that I would summarize the Standard Aircraft's condition as being the result of three things. First, lack of management; second, lack of accounting system; and third, lack of money.

Senator FRELINGHUYSEN. Do you not think that if they had had the same contracts as other concerns, with equal facilities, and the same amount of contracts with the Government, that in anticipation of the completion of those contracts they could have borrowed sufficient money to have carried them through?

Maj. BROWN. That reminds me of something I want to say. I have repeatedly said to Mr. Mingle: "You have contracts, Mr. Mingle, for so many millions of dollars; the law provides that the Signal Corps may advance you 30 per cent of the amount of your contracts through the War Credits Board. If you will come into the office and let us prepare for you an application for an advance to the War Credits Board we will recommend it. You realize that the application carries with it the obligation on your part to give adequate security for the loan and to divulge your financial condition."

His reply was, "No, that is a reflection on my company." He said, "Just as soon as I get up there it will develop that Mitsubishi is back of me, and they do not need money and I can go out and get all the money I need. I do not need any help from the War-Credits Board, and it is a reflection on my company to ask for it."

Senator FRELINGHUYSEN. In your opinion, Mr. Mingle is influenced by his financial backers, is he not?

Maj. BROWN. He claims to be.

Senator FRELINGHUYSEN. And they are Japanese bankers?

Maj. BROWN. He says so.

Senator NEW. A very similar complaint was made by the Curtiss Co. in Buffalo. What can you tell us about that?

Maj. BROWN. The Curtiss Co.'s situation is again one of lack of accounting system. They resent our efforts to obtain parts costs. We must obtain costs for three purposes, first, to enable our responsible officers in the plant to certify vouchers for payment; secondly, to determine the costs of aeroplanes on which fixed price contracts may later on be let; third, to obtain the detailed costs of the parts, in order that we may know what spares are costing. You know that every contract for completed planes carries with it a very large proportion of spares. The cost and the price of those spares has to be determined, and only by keeping parts costs can we reach that determination.

The Curtiss Co. have a desire to limit our accounting functioning in that plant to the determination of the cost of what they call "major assemblies," of fuselage, upper wings, lower wings, landing gear, etc.

Now, each one of those major assemblies contains several spare parts, and if we confine our accounts to major assemblies we would not know the costs of spare parts, and we would not have a detailed cost on which we could get definite figures on which to base a fixed-price contract later on.

Maj. Frank E. Smith has more detailed information on that subject than I have and can explain it better.

There is one thing I should like to mention in connection with their complaint, however, and that is this: Mr. Cole is our Finance Division representative in Buffalo, located at the Curtiss plant. He is a civilian who has been there since they started their contract, was formerly employed by Lybrand, Ross Bros. & Montgomery, and at different times the Curtiss Co. has wanted to take him into their organization to run their accounting business, but Cole has been transferred some months ago to the Signal Corps and is now our representative there.

I asked Cole how much additional factory labor would be required to assemble the details which we require for our parts-costs system. He says not one man. I asked him what labor of any kind, or clerical help, would be required. He said it would take 10 clerks at perhaps \$1,000 each, or \$10,000 a year, office clerks, to do detailed clerical work in the office outside of the plant. In other words, is it worth \$10,000 a year to the Government in the Curtiss plant to know the detailed costs of their manufacture? That is the sum and substance of the complaint of the Curtiss Co. as to our effort to get parts costs in their plant.

Senator NEW. The inference to be very plainly drawn from that is that the Curtiss Co., and I assume that this applies to others, too, do not desire the Government to have a very exact and adequate idea of what their costs really are?

Maj. BROWN. That is a fact, I believe, Senator, but Maj. Smith is so much more familiar with the details of the complaints the con-

tractors have made that I would like to have you ask him those questions. Your statement is right from my standpoint.

Senator NEW. I am simply assuming that is the inference to be drawn from what you say.

Maj. BROWN. Yes, sir.

Senator NEW. There was also a complaint similar to this made by the Dayton-Wright Co. Does the answer made in the Curtiss case and that in the Standard apply to the Dayton-Wright case?

Maj. BROWN. The Curtiss situation applies in so far as the Dayton-Wright people have resented our attempt to get parts costs; yes, sir. There are two further elements of complaint on the part of the Dayton-Wright people, and we spent five hours discussing them yesterday with Mr. Talbot, sr., and Mr. Talbot, jr., and Mr. Smart, their auditor, down at my office. It has been our experience that we get along beautifully with the Dayton-Wright people as long as our officers approve all their purchase requests, which go into their cost-plus contract, and we have no dispute with them on the major items, but as soon as we disapprove a purchase request that we consider improper and unnecessary we have trouble. For example, they kicked yesterday because our approvals officer disapproved a purchase request for some baseball uniforms, some diplomas which they issued for expert shotgun practice for their guards at the plant, some free tires and gasoline for employees riding to and from Dayton, and similar unimportant items.

The CHAIRMAN. You say unimportant. I presume you mean superfluous.

Maj. BROWN. We consider them improper charges. When I said "unimportant" I meant as regards the amount involved, because we have had no real difficulty with them on large expenditures.

Their other complaint against the finance division, however, is more important and is not a complaint against the finance division but a condition which we do not control, namely, we allow depreciation under our cost plus contract on their permanent investment, or on any additional facilities which they may install. In some cases that allowance for depreciation may be as high as 80 or 85 per cent or more. The question that is worrying them is whether or not the collector of internal revenue for the Treasury Department will accept our allowance for depreciation, because if he does not and throw back into their gross income a portion of what we have allowed as expense for depreciation they are going to have to pay out a very large percentage of it in income and excess profits tax, and maybe after they get through with their contract they are going to be landed with a lot of buildings, mortar and bricks, and facilities that represent a high cost to them. Our remedy, as we discussed it with them yesterday, is to go to the Treasury Department—collector of internal revenue—and ask them if they can give us an advance ruling to the effect that they will approve and allow such allowances as we make for depreciation without change. If they will, it will remove the mental anxiety on the Talbots part that such allowances as we make may be disallowed.

The CHAIRMAN. In other words, what they want is that the Government shall be consistent in the matter of depreciation?

Maj. BROWN. Yes, sir.

The CHAIRMAN. And there shall be no collisions or difficulties between one department and the other?

Maj. BROWN. Yes, sir. So you see, summing up the Dayton-Wright position, they do not want us to get parts costs; they dislike our disapproval of what we consider unnecessary expenses, and they are worried about the Government's attitude on depreciation.

The CHAIRMAN. Let me ask you if you have determined to see the Department of Internal Revenue regarding that matter?

Maj. BROWN. We are considering that question and the only uncertainty in our minds is how we shall proceed. Maj. Smith is a member of the interdepartmental cost accounting committee for all the bureaus of the Army, and our belief is, inasmuch as all the bureaus of the Army and the Navy as well, have cost plus contracts, that involve allowances for depreciation, that if we go as a solid front to the collector of internal revenue we may get better action, and we are trying to see if we can do that promptly.

Senator NEW. Do you know anything about the Navy Department's experiences with their contracts?

Maj. BROWN. Their experience is much more happy than ours. It is remarkable that we hear of no complaints against the Navy. We had a conference day before yesterday with Commander Smith and Lieut. Small of the Navy, officers who are performing functions for the Navy similar to ours, in joint meeting with our own district managers, and it developed at that meeting, in fact, we already knew it, that their accounting system is an exact parallel of ours, and that they are getting production and they intend to insist in the Curtiss plant and the Standard plant that they get all the detailed information as to costs that we are now asking. They make the flat statement that nothing that we are doing in the finance division of the Bureau of Aircraft Production, in either the Curtiss plant or in the Standard plant, has any basis for the contention of those contractors that we are impeding their production.

Senator NEW. Is the situation in the field organization occasioned wholly by the cost-plus contracts?

Maj. BROWN. It is designed to take care of the cost-plus contracts, but it is a fact that we would need all of our present organization, and all we contemplate, to make the accounting determinations and to function as approvals officers, to settle and adjust prices and allowances under existing contracts if all of them had been made at fixed prices to start, because of the fact there have been so many changes in specifications since the machines were put into production.

Senator NEW. You said something a while ago, I think in the general memorandum you read there, about the War Credits Board and the appeal to it for assistance. Do you know anything about any advance to the Curtiss Co.?

Maj. BROWN. Yes, sir; the Curtiss Co. received an advance from the War Credits Board of \$11,900,000, of which \$3,900,000 was advanced by the Navy and \$8,000,000 by the Signal Corps.

The CHAIRMAN. What for?

Maj. BROWN. The Curtiss Co. needed money in order to fulfill its contracts, and they had outstanding, as I understand it, note issues aggregating several millions of dollars, and while I was new in the organization at the time, I recall discussions as to the protection which the Government could get for its advances. There were several schemes suggested, all of which, however, involved the necessity of the Government taking a junior lien, either three or four times removed from the property for such advances as it made. Such a

junior lien was considered inadvisable because the officials involved thought at some future time they might have to step in and protect that advance anyhow, by taking up these prior liens, so a scheme was ultimately adopted and put into effect of advancing the Curtiss Co. sufficient funds to take up all its prior liens and let the Government take a mortgage secured by notes, which would be a first lien on the property. That was done.

Senator NEW. Go ahead and tell us if any other advances were made to the Curtiss Co., and if there were any recoupments of these advances, something of what the general financial condition of the Curtiss Co. is, if you know it. Just in one general answer now.

Maj. BROWN. The Signal Corps purchased and installed in the Curtiss plant Government-owned machines in excess of \$1,000,000. That equipment is still there and is owned by the Government and is being used by the Curtiss Co. In addition to that the Government has made advances to the Curtiss Co. in the shape of materials, similar to the kind furnished to the Standard Aircraft Co., over \$2,000,000 worth. There has been absolutely no repayment of that advance. I called it to Mr. Potter's attention and representatives of the Curtiss Co. were down here three weeks ago, and at a conference in Mr. Potter's office the agreement was made that as soon as the Curtiss Co. could collect its indebtedness from the Navy they would make part payment on their indebtedness to the Signal Corps, and that they would as promptly as possible reduce that indebtedness. The fact remains, however, that there is not much likelihood of that indebtedness being entirely liquidated, because the Curtiss Co. is very short of funds.

When the Signal Corps advanced, with the Navy, this \$11,900,000. a balance sheet was furnished to the War Credits Board which showed that their outstanding liabilities, consisting of bills payable, notes payable, etc., were slightly in excess of \$4,000,000, and in a supplemental agreement under which this advance was made by the War Credits Board, it was provided that the company would, as soon as possible, reduce its outstanding liabilities of that character to not to exceed \$4,000,000. The agreement also provided that to protect the Government's interest, a comptroller, to be approved by the Secretary of War and the Secretary of the Navy, would be elected a director and placed in the office of the Curtiss Co. to supervise expenditures and generally have direction of their financial affairs. That comptroller was selected, a man by the name of W. W. Moss.

As soon as he got up there it was discovered that the balance sheet on which the Curtiss Co. secured their advance was a misstatement, that instead of their outstanding liabilities being slightly in excess of \$4,000,000, there was an additional \$3,500,000 or more represented by invoices of contractors scattered around in desks of foremen and in officials' desks in the office and throughout the entire plant. Those invoices had never been tabulated, and had never been put on the company's books and therefore did not appear in the statement given to the War Credits Board as liabilities of the company.

The CHAIRMAN. Was that an intentional mistake?

Maj. BROWN. I have no way of knowing, sir.

Their trial balance, as of June 19, 1918, shows that out of the Government loan of \$11,900,000 they still owe the Navy \$2,114,726.60, and the Army \$5,778,810.77.

The CHAIRMAN. Is that exclusive of the \$11,900,000.

Maj. BROWN. No, sir; it is out of that \$11,900,000 that they still owe those two amounts. You asked how much had been reimbursed. There is unpaid out of the \$11,900,000, as of June 19, 1918, \$7,927,537.37. They have repaid practically \$4,000,000 but while that repayment has taken place their outstanding liabilities, which were agreed to be reduced to \$4,000,000 when the advance was made, are now \$9,288,019.44.

The CHAIRMAN. Is that liability increasing?

Maj. BROWN. Yes, sir; it has been increasing ever since the loan was made.

The CHAIRMAN. What reason do they give for the increase, if any?

Maj. BROWN. I do not know definitely.

The CHAIRMAN. In that connection is it not a fact that the work has been suspended upon production of the Bristol plane?

Maj. BROWN. I am so informed.

The CHAIRMAN. How recently has that occurred?

Maj. BROWN. It is about two weeks, sir.

Senator REED. If it is proper, I have a balance sheet which might go in the record at this point.

The CHAIRMAN. All right, it may be included in the record.

(The document referred to is here printed in full, as follows:)

Daily statement, Curtiss Aeroplane & Motor Corporation, June 19, 1918.

Cash.....			\$1, 137, 233. 00
Accounts receivable:	Suspense.	Current.	
United States Navy, fixed price....	\$127, 276. 91	\$1, 325, 411. 56	
United States Navy, cost plus.....		522, 650. 41	
United States Army, fixed price....	441, 199. 95	787, 095. 35	
United States Army, cost plus.....		388, 146. 64	
British Government.....	133, 580. 87	273, 276. 21	
* Willys-Overland Co.....	1, 350, 235. 15		
Willys-Morrow Co.....	76, 441. 17		
Curtiss Co., Toronto.....		62, 957. 96	
Burgess Co.....	444, 010. 45		
Curtiss Engineering Corps.....		54, 626. 24	
Miscellaneous.....	213, 550. 23	75, 233. 22	
	<hr/>	<hr/>	3, 489, 397. 59
	2, 786, 294. 73		
Total cash and current accounts.....			4, 626, 630. 59
Notes payable:			
Trade creditors.....	\$1, 335, 852. 39		
Bank loans.....	1, 250, 000. 00		
Liberty bonds.....	200, 000. 00		
Others.....	16, 770. 00		
	<hr/>		\$2, 802, 622. 39
Accounts payable:			
Fixed price.....	4, 614, 425. 26		
Cost plus.....	1, 870, 972. 29		
	<hr/>		6, 485, 397. 55
			9, 288, 019. 94
* Less per contract charge, Willys-Overland Co., estimated.....		1, 000, 000. 00	
		<hr/>	8, 288, 019. 94
Government loan—Balances due:			
United States Navy.....	\$2, 148, 726. 60		
United States Army.....	5, 778, 810. 77		
	<hr/>		7, 927, 537. 37
Total liabilities.....			16, 215, 557. 31
Excess of liabilities over cash and accounts receivable.....			11, 588, 926. 72

Senator NEW. Is there anything further, Major, you want to add in regard to the Curtiss Co.?

Maj. BROWN. No, sir.

Senator NEW. What is the relation of the Finance Division to the Spruce Production Division?

Maj. BROWN. We advance the funds to the disbursing officer on the coast of the Spruce Production Division, out of which he purchases lumber, builds the cut-up plants, the dry kilns, the railroad extensions to logging developments, and the equipment of logging contractors under cost plus contracts, and the miscellaneous organization and operating expenses of the division. In addition to that it is our function to bill to the aeroplane contractors and to the allied governments the lumber produced by the Spruce Production Division. We had assumed that those costs would be determined by an accounting department which Col. Disque, in charge of the Spruce Production Division, would install, and our plans were laid accordingly. This week, however, Mr. Ryan has informed us that we shall take the direction of that accounting department and also of the administration of the cost plus contracts, and through their accounting department determine the costs and the prices. We are planning now to do that. There is a great amount of money involved in the operation of the Spruce Production Division; they have already had authorized for expenditure over \$70,000,000, and my informal advice is that that amount will be increased to over \$100,000,000.

Senator NEW. What is the relation of the Finance Division of the Bureau of Aircraft Production to the Chief Signal Officer and the Director of Military Aeronautics?

Maj. BROWN. We have heretofore, prior to the President's order of May 10, 1918, functioned as the financial department for the entire Signal Corps, which included the present activities of the Bureau of Aircraft Production, the Chief Signal Officer, and the Division of Military Aeronautics. The President's order, that I have mentioned, directs that the activities and the personnel be divided. We had hoped that that division would not include the Finance Division, because we have been functioning satisfactorily and efficiently for the whole organization, and in my conferences with the new chiefs it was their expressed desire that we continue to so function, but it was ordered otherwise, and our present plan is to make a division of our Finance Division into three separate units as promptly as it can be effected. I have set a date of September 1 as the time when we will be able to make the division. It necessitates quite a great deal of accounting, separate records, and separate personnel, and the chief difficulty will be the necessity on the part of Gen. Squier and Gen. Kenley for creating entirely new financial departments to take over the work we are now doing for them. We have a great deal of difficulty at present in getting adequate personnel for our own division.

The CHAIRMAN. You mean by that competent accountants? Competent clerks?

Maj. BROWN. Competent clerks and competent experts. We have a great deal of difficulty in securing help, and our present force will not be decreased by reason of transferring these financial functions to the new divisions, whereas they will be under the necessity of cre-

ating two entirely different units. Where they are going to get the trained personnel I do not know.

Senator New. I think that is all with Maj. Brown. We have Maj. Smith and Maj. Rose to follow.

STATEMENT OF MAJ. A. C. DOWNEY (Resumed).

The CHAIRMAN. Maj. Downey, I have been shown a photographic copy of a letter of date November 26, 1917, signed by J. B. Tarbox and addressed to Mr. William A. Morgan, general manager of the Curtiss Airplane & Motor Corporation, Buffalo, N. Y., together with a photographic copy of bill of Crisp, Randall & Crisp, of 80 Broadway, New York, to the Curtiss Aeroplane Co. for services in case of the Wright Co. against the Curtiss Aeroplane Co. Could you furnish to the committee a copy of this letter, or leave it?

Maj. DOWNEY. I will leave it here.

The CHAIRMAN. The committee has also been furnished a copy of a letter dated December 24, 1917, signed by C. M. Keys, and addressed to Mr. William A. Morgan, vice president and general manager of the Curtiss Co., referring to the same subject matter, which letter is as follows:

(The letters referred to are here printed in full, as follows:)

THE CURTISS ENGINEERING CORPORATION,
Garden City, L. I., N. Y., November 26, 1917.

Mr. Wm. A. MORGAN,

*General Manager Curtiss Aeroplane & Motor Corporation,
Buffalo, N. Y.*

DEAR MR. MORGAN: Mr. Keys has asked me to submit to you in writing two matters which it is believed should have the attention of our board of directors at their next meeting.

The first of these is the attached bill of Messrs. Crisp, Randall & Crisp, in connection with the now terminated litigation in connection with the Wright patent. The bill amounts to \$45,509.71. It is very high considering the fact that the case was never brought to trial, although preparation was made for trial on three distinct occasions. On the other hand, the work done by Messrs. Crisp, Randall & Crisp extends over a period of nearly three years, during which time they have received, besides expenses and the small credits on the bill, no remuneration. At times the work in connection with the suit was very heavy, but there were long periods when there was little being done, although Judge Crisp was always at our beck and call, and there were many minor matters in connection with the suit which were adjusted by him. He also claims during the past 8 or 10 months to have acted in our behalf in connection with the cross-licensing agreement. Judge Crisp did a great amount of work, but, as we all know, the credit for this arrangement is not entirely his, our Mr. Keys having initially negotiated the deal for this company and the writer spent much time in the consummation of the agreement. Also the judge was acting as a member of the subcommittee on patents of the National Advisory Committee for Aeronautics. But it is, I believe, a fact that Judge Crisp has had the interest of our company at heart throughout his connection with the cross-license agreement and the formation of the Manufacturers' Aircraft Association.

The bill was originally submitted by Judge Crisp to Mr. Keys and was later forwarded to me in the usual course.

The second matter is that of possible settlement of our hydroaeroplane litigation involving patent applications of Mr. Curtiss and one Albert S. Janin. The subject matter of this litigation is the matter of the end or side floats on the flying boats and hydroaeroplanes. Between an interference in the Patent Office and a suit against Janin instituted by us a year ago, the litigation has been pending a period of four or five years. The Janin interests now offer to settle with us for \$75,000. They are willing to consider a counteroffer from us and it would not surprise me if they could be persuaded to settle for \$50,000.

Inasmuch as the party, Janin, has received a decision of the Court of Appeals of the District of Columbia, awarding him one of the claims in dispute, of considerable value

to us, and he is likely to be able to obtain, independently of the suits now pending, other claims which will be of value, I am in favor of settling with him if the board can see its way clear to investing the amount of money asked at this time. In my opinion the investment will be a profitable one. Moreover, this litigation is the only one, now that the Wright litigation has been settled, which stands between the Curtiss companies and an absolutely clear patent record. The attorney for Janin has been largely responsible for the opposition which has been stirred up against the operation of the cross-license agreement.

I shall be very glad, indeed, to go into these matters in detail with you, or, in the event you should think it advisable, appear at the board meeting, too, for the purpose of outlining the situation to and answering the questions of the members of the board. It is particularly advisable to reach a decision in the Janin matter at this time, since in the event that decision is deferred, the offer may be withdrawn. With this in view will you kindly advise me whether or not it will be feasible to have them considered at the next board meeting so that I may in turn advise the interested parties.

Yours, very truly,

J. P. TARBOX.

P. S.—Bill will be inclosed separately and sent to-morrow.

The Wright Co. v. The Curtiss Aeroplane Co.

CRISP, RANDALL & CRISP,
New York, October 5, 1917.

THE CURTISS AEROPLANE CO.

To CRISP, RANDALL & CRISP, Dr.

Dr.

To disbursements in the above entitled matter, as follows:

Stenographic work.....	\$3. 30	
Telephones, telegraphs, etc.....	24. 16	
		\$27. 46
To professional services rendered in above matter from July, 1914 to date..	50, 000. 00	
		<u>50, 027. 46</u>

Cr.

June, 1915, by check on account of services.....	\$1, 000. 00	
March 2, 1917, by check on account of services.....	3, 500. 00	
August 30, 1917, by refund of deposit by defendant from United States District Court.....	17. 75	
		<u>4, 517. 75</u>
Balance.....		45, 509. 71

NEW YORK, December 21, 1917.

Mr. WM. A. MORGAN,

Vice President and General Manager,

The Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y.

DEAR MR. MORGAN: I beg to report herewith progress made so far in the settlement of the matter of Judge Crisp's bill of \$50,000 against the Curtiss Corporation for services rendered.

We have not so far been able to reach a definite agreement with Judge Crisp.

We have covered the following points:

1. The opinion of Messrs. Russell and Tarbox, after going into the matter pretty thoroughly, is that \$20,000 ought to be the minimum and \$30,000 the maximum payment for such services.

2. It is impossible for Judge Crisp's office to make up an itemized statement, as the office has never kept a record on services rendered, having proceeded under the old understanding that there would be a blank charge for such service. Judge Crisp's estimate of time is 1,200 hours of work.

3. We have ascertained that the Wright-Martin Co. paid Messrs. Fish & Neave between \$40,000 and \$45,000 for their services in the same litigation for the same period of time covered by Judge Crisp's bill.

4. We have decided to make it perfectly clear to Judge Crisp that this corporation is not paying anything for services rendered in connection with the Aircraft Association.

5. We have decided that it would be unwise in view of present conditions to make any settlement to Judge Crisp which would preclude our making a contract with him to work with the corporation in further litigation that might arise out of the Wright patents.

Having the above considerations in mind we offered a settlement at \$25,000 and Judge Crisp has, in view of this offer, offered to reduce his bill to \$35,000. Your committee may decide to recommend this payment to the board of directors at the meeting next Wednesday.

We have found in Washington a rumor that a specific part of the bill to the corporation is for services rendered in connection with the Manufacturers' Aircraft Association. We think this rumor unjust to Judge Crisp, as he has made no specific claim for remuneration for anything he did in this connection.

Yours, very truly,

C. M. KEYS.

(Whereupon at 2 o'clock p. m. a recess was taken until 3 o'clock p. m. of the same date.)

(AFTER RECESS.)

STATEMENT OF MAJ. FRANK E. SMITH.

Senator NEW. Please state your full name.

Maj. SMITH. Frank E. Smith.

Senator NEW. What is your rank?

Maj. SMITH. Major, Signal Corps, United States Army.

Senator NEW. What position do you occupy in the Bureau of Aircraft Production, Major?

Maj. SMITH. I am the officer in charge of the approvals and appraisals sections, now departments, and also chief executive officer in charge of the field force of the finance division.

Senator NEW. You are a civilian officer?

Maj. SMITH. Yes, sir.

Senator NEW. What were your business connections prior to your entering the service?

Maj. SMITH. For a long period of about nine years prior to the war I was engaged in connection with the automobile industry in various branches of it and principally in managerial positions which had to do with the administration of large sums of money and the production of motor cars and their component parts. Prior to that time I was connected with the American Locomotive Co. in various managerial and assistant managerial capacities and in investigating capacities at various points in the United States. Between those two periods I was for one year in Bridgeport, Conn., in charge of the production of the American and British Manufacturing Co., who manufacture ordnance, automobile motors, frames, landing guns, and various things in connection with ordnance for the Government. That takes us back 18 years. Prior to that time I had received a technical education. I had learned two trades. I had been to a business college and had taken a course in the Rhode Island School of Design and was proficient in accounting and business law.

Senator NEW. You think that experience qualified you for your present position?

Maj. SMITH. Yes, sir.

Senator New. How long have you been in the service?

Maj. SMITH. I have been in Washington since the latter part of last summer. First I was assisting the Ordnance Department to find capacities for ammunition, shrapnel, and shell, on account of my familiarity with that branch of work, and after about October 1 I went with the Signal Corps, was commissioned on the 3d of November, 1917, as a captain in the Reserve Corps, and received promotion to a majority rank in the United States Army, temporary, on December 22, 1917.

Senator New. What prompted you to enter the service, Major?

Maj. SMITH. I had an idea that every man who could detach himself from his business life, and was above the draft age, should come to Washington or go abroad, and endeavor to use his business experience and knowledge, obtained over a long period of business life, in some way that would help the Government in the existing emergency, and that was my first reason for coming to Washington. It was my original belief that I could do more good abroad and might possibly join one of the expeditions which were going over there to help reorganize affairs back of the lines in France, but after I had gotten down here and learned the extreme need for men with experience to handle matters in this country, it seemed better for me to stay here, until such time, at least, as conditions here were relieved.

Senator New. State just what your positions are with the finance division; if more than one, what the nature of them are.

Maj. SMITH. My work covers several duties. First, in connection with what is now the approvals department, the detailed functions of which, as well as the functions of the appraisals department, will be given you shortly. I am executive officer in the field, in charge of the entire finance division field force; the chairman of the rulings board of the finance division; the chairman of the adjustment board of the finance division; member of the War Department interdepartmental cost conference. The functions of the approvals department of the finance division are very broad in their scope. In ordinary business life we would be considered the technical advisers of the financial interests, as the knowledge that we have has to do with the propriety of all sorts of expenditures, and to pass on the propriety of expenditures and to make such criticism constructive necessitates full foreknowledge of what you are going to do, and that is one of the reasons it is so hard to get the proper personnel for our work.

The functions of the Approvals Department consist in (a) passing upon the propriety and price of all purchases made by cost-plus contractors, including airplane and motor material and supplies, jigs, fixtures, special tools, dies, formers, and miscellaneous equipment, applicable directly or indirectly to cost of product contracted for; (b) passing upon propriety and amount of wage or salary increases, at plants of cost-plus contractors; (c) passing upon phraseology, propriety, and price of subcontracts entered into by cost-plus contractors; (d) investigations of plants and their organizations, including suggestions for improvement in methods and elimination of waste; (e) planning, laying out, and supervising the taking of actual physical inventories of airplane and motor materials, supplies, equipment, etc., in plants of cost-plus contractors, or in plants of prospective contractors; (f) checking and certifying to receipt of all materials,

equipment, etc., at plants of cost-plus contractors; (g) supervising storeroom and storeroom records in plants of cost-plus contractors and certifying to delivery of materials on proper requisition into actual production; (h) identifying, taking title to, and keeping track of all Government-purchased units delivered to plants of cost-plus contractors; (i) identifying, taking title to, and arranging for disposition of various Government property, including obsolete machinery, equipment, materials, scrap, etc.; (j) helping contractors to find outside capacity for fulfillment of subcontracts and miscellaneous purchases; (k) conducting investigations, effecting adjustments and settling damages account cancellations of Government contracts, made necessary for any reason; (l) obtaining assistance for cost-plus contractors from other Government agencies, including priorities, traffic, labor, etc.

The chief functions of the Appraisals Department are appraisals of plants, buildings, and equipment, at start and at completion of Government cost-plus contracts, pursuant to contract requirements, also make all other appraisals necessary for purposes of Bureau of Aircraft Production.

The functions of the Rulings Board, of which I am chairman, are to make formal rulings on the administration of contracts, including the interpretation of the various phrases and terms, after presentation to the board of all facts bearing on the points at issue, and with the advice of the contracting officer and other financial counsel.

The functions of the Adjustment Board, of which I am chairman, consist of reviewing the findings of representatives of the section, which we have engaged in the Approvals Department, known as the "Contract Adjustment Section," whose representatives are sent into the field to investigate, analyze, and recommend adjustments of damages, if any, on account of cancellations by the Government, for any cause, of their cost-plus or fixed-price contracts. These adjustments involve several millions of dollars and require careful investigation both of the plant of the main contractor and also the plants of subcontractors.

The general functions of the War Department Interdepartmental Cost Conference cover the various methods and practices of the War Department, with a view to standardization of procedure, looking to greater efficiency and enabling ready comparison or consolidation of the reports, for the information and guidance of the General Staff, the executive officers of the Government, and the Finance Committees of Congress.

Senator NEW. What is the personnel of the field force, including commissioned men, enlisted men, civilians, and all?

Maj. SMITH. The personnel of our field force, including field approval officers, property officers, and accounting officers, as of June 1, was 1 major, 8 captains, 55 first lieutenants, 53 second lieutenants, or a total of 117 commissioned officers; also 17 sergeants, 1 corporal, and 368 privates, or a total of 417 enlisted and noncommissioned men. The civilians in the field are 2 aeronautical-mechanical engineers, 61 expert cost accountants, 1 junior accountant, 132 production experts, 54 stenographers, 5 typists, 16 clerks, 13 file clerks, and 6 messengers, or a total of 290 civilians and a grand total for the field force of the finance division of 824 people.

Senator NEW. What are the particular qualifications necessary for officers for your work?

Maj. SMITH. The men for our work, particularly for the approvals department, should have a mechanical or technical training and broad experience in a manufacturing or professional field; must be possessed of energy, tact, firmness, and diplomacy; with sufficient mental poise to permit of their having forehand knowledge of their duties, and assurance of successful handling of the men under them, and the meeting of the contractor on a reasonably equal footing, which will assure the greatest measure of cooperation.

Such qualifications usually come only with mature years; therefore our recruiting field is outside the present draft age and among men who are large earners in private life and who either hold positions of responsibility with large corporations or own and operate their own business.

Senator NEW. Have you had any particular trouble in securing the personnel for that work?

Maj. SMITH. Yes, we have.

Senator NEW. If so, to what do you ascribe your inability to secure it?

Maj. SMITH. We are at the present time very short-handed in personnel. In fact, due to the contracts and subcontracts which we already have in force and in prospect and upon which we must function, we are facing a pressure of work that will shortly be two or three times as great as at the present time. We are short the following personnel:

Lieutenant colonel.....	1
Majors.....	7
Captains.....	47
First lieutenants.....	165
Second lieutenants.....	194
<hr/>	
Total.....	414
Enlisted men.....	430
<hr/>	
Grand total.....	844

We are beset with all sorts of difficulties in connection with securing commissioned personnel, not the least of which is getting the commissions through for the men we are able to find and recommend for such commissions.

Senator NEW. I was just going to ask you if you have any trouble in that way?

Maj. SMITH. Yes, sir; we have great trouble in finding men we can recommend for such commissions, and it is most discouraging, disconcerting, and embarrassing to call men into the service, of mature years, from private life and from high positions at considerable sacrifice, by giving them reasonable assurance that they will be commissioned, only to have their commissions held up and delayed from two to five months.

The CHAIRMAN. Why is their commissioning necessary?

Maj. SMITH. The type of men we have to get are men of affairs, men outside the draft age, men who feel that the least that the Government can do for them in exchange for their sacrifice and for their coming down here and suffering the hardships incidental to Government service in war times, is to clothe them with a uniform with

suitable rank as indicative of the fact that they are serving their country. We find that to be almost universal with business men.

The CHAIRMAN. And yet we hear complaints from a great many men that the uniform is a hindrance to them, since it subordinates them to the requirements of military standards and orders of the War Department and deprives them of all initiative?

Maj. SMITH. To a certain extent that is true, Senator, but you must bear in mind the fact that some one started this airplane proposition by making it a military organization. It is impossible to ride two horses. It must be one or the other. If the personnel were all civilians, well and good, but it is too late for this. Our organization is military as to its uniform and deportment, but strictly civilian in its basic business knowledge and methods.

The CHAIRMAN. It is mixed up. The organization of which Mr. Ryan is the head is fundamentally civilian.

Maj. SMITH. Yes, sir; that is true, but the general scope of our work in the field requires the handling of men, who are at best very hard to handle, unless they really have their work at heart and are really sacrificing something, be it money or convenience, for the good of the cause. The ordinary civilian, at this time, who is working for the Government, is working for his pay and watching the clock. That is one of the reasons we must have enlisted men in the field.

The CHAIRMAN. Of course you do not, in that statement, include a large number of men who are down here working for the nominal compensation of \$1 a year.

Maj. SMITH. No; I mean the men who come to us from the civil service and sometimes otherwise. The people seeking positions at present, are simply looking for the pay they get. We find in the field that we can not control our men on these large contracts unless they are enlisted or commissioned. That is the reason we get so many enlisted men. We find that enlisted men will work straight through without rest two or three days and nights, if necessary, and, as a rule, they seem glad to do any task that is given them to perform.

The CHAIRMAN. What are the main divisions of the Approvals Department, and explain the functions of each of them as briefly as you can, Major.

Maj. SMITH. The main divisions of the approvals department are the general administration and the office management sections here in Washington; a personnel section which tries to get for us suitable personnel; an instruction section which has charge of the training of these men in the particular branch of work to which they are to be assigned; a contract-analysis section, which analyses the contracts as they come to us from the purchasing department or division, in order that we may find in those contracts anything that may be particularly peculiar to that contract, under which we will have to perform some special function; the material-purchases section, which handles and tabulates the costs of various materials used in aeroplanes and motors, for advisory purposes for our men stationed in different parts of the country; a construction section, which has to do with the handling of approvals in connection with the building of plants, the construction, for example, of acetate and menthol-alcohol plants, and numerous different types of plants that the Government finds it necessary to have at this time to supply itself with the necessary materials; a machinery section, which specializes

on machinery and tools and helps the contractor to find tools when he needs them, and to see that the prices paid are satisfactory; a jigs, fixtures, and tools section, which passes upon the cost to the contractor of special tools which he may buy in connection with Liberty motors, or other types of motors or aeroplanes; miscellaneous shop equipment section, which has to do with the purchase of miscellaneous equipment as used in aeroplane and motor plants; a lumber section, which looks particularly after the lumber situation, both as to the condition of lumber received, its application to contracts, and to the shrinkage which we are finding at various different points, also the disposition of the rejected lumber and the offal from the cutting up, etc.; the chemicals section, which handles the dope plants, including acetate and methol-alcohol and castor-oil plants; a labor section, which keeps in close touch with the labor conditions at various contractors' plants and sits with the labor representatives of the Bureau of Aircraft Production, and with the contractors in arriving at increased labor rates and the settlement of labor disputes; a plant-protection section, which works with the so-called plant protection department of the Bureau of Aircraft Production, and decides as to whether the equipment for plant protection recommended for the contractors is to be paid for by the Government or by the contractor, and as to whether the prices are satisfactory; a materials-disposal section, which disposes of obsolete materials which may be made obsolete at plants of contractors by changes in specifications or design, or by cancellation of contracts, and the sale of scrap that results from the ordinary machine-shop operations in connection with motors or planes; the reports and statistics section, that compiles information in regard to the efficiency of various plants, and special investigation section, which makes particular investigations for the benefit of the Finance Division or to be passed along to the higher officials of the Bureau of Aircraft Production; the standard-costs section, which compiles costs on various items which are manufactured, or about to be manufactured, by the Bureau of Aircraft Production, and presents this information to the director of purchases for his guidance; traveling-supervision section, which supervises men in the field, such as auditors, and checks them up to see that the men are actually performing the duties they are sent out to perform. That, I think, covers in a general way the scope of various sections of the approvals department.

Senator New. We have had some complaint that the carrying out of the work of the finance division in the field sometimes tends to retard production. Do you think there is any basis for that complaint?

Maj. SMITH. No sir; I do not. I think very much to the contrary. I think that we have been a great help to the contractors, and that our men, if they were removed from the plants, would have to be replaced by other men who would have to perform similar functions, no matter what you might call them.

Senator New. What is the general routine followed now in connection with the approvals made of the contractors' purchases and the various steps in regard to payment by the Government?

Maj. SMITH. If I may, I will read a letter bearing upon that subject requested recently by the General Staff and also by the Department of Justice, which covers briefly the general scope.

(The letter referred to is here printed in full, as follows:)

JUNE 1, 1918.

CHIEF EXECUTIVE OFFICER IN COMMAND FIELD FORCE,

Signal Corps, Finance Department.

Vouchering and payment of contractors' material purchases under terms of Signal Corps cost-plus contracts.

1. Following your request for advice regarding method followed by our finance officers in connection with handling, recording, and paying for material purchased and used by contractors, under Signal Corps cost-plus contracts, have outlined below the complete transaction from the initial ordering of material by the contractor at his plant up to the payment by disbursing officer of vouchers covering same.

2. *Contractor* determines quantity and description of all items required for performance of the contract, as indicated by specifications, and prepares a purchase order showing description of item, specifications, quantity, price and terms, vender, delivery, and any other essential information.

3. *Approvals officer* approves purchase order as to propriety, quantity, price, terms, delivery, and vender with whom placed. Information on these points is obtained from the contract, specifications, bill of material, contractor's purchasing department records, outside sources, and in some cases by special investigation conducted by District or Washington offices.

4. *Property officer* verifies physical delivery at contractor's plant of item ordered and checks it as to quantity received and condition of articles.

5. *Inspector* inspects material and passes upon its conformation to specifications.

6. *Property officer* oversees the placing of accepted material in the contractor's storeroom under the control of property officer, to be used as required for production. supervises the maintenance of records controlling such material, and verifies requisitions for material issued into contractor's plant for production.

7. *Contractor* physically receives material, stores it, and prepares public voucher, signing certificate thereon that account is true and correct and payment therefor has not been received.

8. *Plant accounting officer* audits public voucher, comparing it with copy of purchase order approved by approval officer and with receiving slips, showing signature of property officer for receipt of material and quantity received; obtains report from inspection officer of inspection and acceptance of material, verifies price, discounts, extensions, footings, contractor's approval of invoice for payment, and certification on public and supporting vouchers; enters in Government Material Register description, quantity, and value of material for which contractor has been reimbursed; accounting officer then certifies on public and supporting vouchers that material has been delivered to the Government and that account as stated is correct and payable. The voucher is then forwarded to the Officer in Charge Accounts Section, O.C. S. O., Washington, D. C.

9. *Officer in charge accounts' section, Washington*, examines voucher as to form, certifications, and reference to contract authorizing charges; verifies calculations; secures approval of contracts section; records vouchers as approved; certifies to disbursing officer for payment.

10. *Remarks.*—Contractor acts as bailee for Government and must, on termination of contract, account for all materials paid for by the Government, either as finished product, rejected parts, scrap, or materials on hand as shown by actual physical closing inventory.

(a) Control of material up to the time it is issued from contractor's storeroom is maintained by property officer.

b) Sales of scrap, obsolete material, rejected parts, etc., are handled or controlled by approvals officer.

(c) Determinations as to amounts allowable for wastage, cutting, etc., are made by the accounting officer and approvals officer.

(d) Records of articles or parts finished, inspected, and accepted are maintained by the property officer.

e) Closing inventory, to show materials on hand at termination of contract, will be taken by approvals officer assisted by and with cooperation of accounting and property officers.

11. If any further details are required by the General Staff as to our method of handling

(a) Disposition of excess materials;

b) Disposition of scrap and obsolete materials and parts;

(c) Detailed records kept;

d) Methods of inventorying;

or any other matter in connection with cost-plus contracts, we shall very much appreciate further advice in the premises.

FRANK E. SMITH,
Major Signal Corps, United States Army.
Chief Executive Officer in Command Field Force Signal Corps.
Finance Department.

Senator NEW. You think that the Government's interests are fully protected by that procedure?

Maj. SMITH. Absolutely, sir.

Senator NEW. Does the finance division exercise supervision and audit pay-roll expenditures by contractors?

Maj. SMITH. Yes, sir; it does.

Senator NEW. Is this same supervision exercised over salaries paid officials in contractor's organizations?

Maj. SMITH. Yes, sir.

The CHAIRMAN. You mentioned some time ago in detail what the force of one of your finance divisions consisted of. Is that force paid from the appropriations for aviation or out of the general appropriation for salaries in the Army bill?

Maj. SMITH. I shall have to ask that you call for this answer from Maj. Brown, who is in charge of the appropriation department.

Maj. H. S. BROWN. Our big appropriation of \$640,000,000 provides for the payment of salaries of civilians and of the Officers' Reserve Corps. Our own disbursing officers pay the salaries of civilians and we have allotted to the Quartermaster's Corps funds from our appropriation for the payment of officers in the Reserve Corps. The Quartermaster's Corps pays all officers' salaries.

Senator NEW. Has the finance division approved, or allowed to be vouchered and paid, any excessive salaries, to officers of contractors' organizations?

Maj. SMITH. Various salaries which are larger than we think should be passed, have been presented by various contractors, and in some cases we are paying a part of those salaries until such time as we can determine what a proper salary return may be for the individual.

Senator NEW. Maj. Smith, I would like you to mention a case.

Maj. SMITH. We will take the case of Mr. H. B. Mingle, president of the Standard Aircraft Corporation, who is supposed to be drawing a salary of \$62,000 per year, and who in private life, before the present emergency, was a lawyer and had no particular knowledge of manufacturing activities. This particular presentation is made by the Contractor, to be passed as part of the "actual cost" under the contract, but we have refused payment on the grounds that the salary is excessive and that we will determine what the Government considers to be a fair compensation for that position and will at that time make an adjustment.

Senator NEW. Are there any other cases that you have in mind where excessive sums have been asked in the way of salaries?

Maj. SMITH. I have particularly in mind the three main salaries paid at the Dayton-Wright plant in Dayton. Mr. H. E. Talbot, sr., is paid \$35,000; Mr. H. E. Talbot, jr., is paid \$30,000; and Mr. Kettering is paid \$35,000. Mr. Talbot, sr., spends a very small portion of his time in connection with the business of the contractor for the Government. Mr. Kettering spends but a very small portion of his time actually on Dayton-Wright work, as he is manager, engineer.

and director of various other activities in and about Dayton. Mr. H. E. Talbot, jr., spends the major portion of his time on the work. Here is a case where initially the salaries are high, and, in the second place, the men do not give their entire time to the Government, although the presentation has been made for the Government to pay the full amount as "actual cost" under the contract.

We are trying to arrive at a fair compensation for positions of that sort, and to that end have presented the matter to the interdepartmental cost conference of the War Department.

The CHAIRMAN. These gentlemen say that they are compensated on the basis of a bogie price, which, I think, they stated was \$7,000 for De Haviland planes. Any decrease in cost below that sum they get 25 per cent of. If the cost exceeds that sum they still get their percentage of profit upon the bogie price, but nothing upon the excess cost. That being the case, in what way could these salaries possibly be figured in as affecting the profits under the contract?

Maj. SMITH. In the first place it is a transfer of profits, if you please, from the corporation to the individual, which, you might say, takes the return out of the excess-profits tax.

The CHAIRMAN. Still it would be subject to the income tax against individuals. The point I have in mind is, that if the Government has fixed a standard of profits, how an additional cost that might occur should affect the contract.

Maj. SMITH. Our position in regard to the bogie price is this: The prices in the majority of cases have been so high that we have not considered the bogie price so much in our analysis of costs. We have tried to hold the cost down to what we considered to be reasonable limits with the idea that before these contracts were finished there would be some adjustment of the bogie prices.

Maj. BROWN. All of these contractors are probably going to beat their bogie prices, and therefore any excessive salaries that they now include in their cost means that they are reducing the amount which the Government would otherwise save by reason of its sharing to the extent of 75 per cent in any amount that the actual cost is less than bogie.

The CHAIRMAN. When you say that they are going to beat the bogie price, do you mean that they are going to produce at a price below the bogie?

Maj. BROWN. Yes, sir; considerably; in some cases.

The CHAIRMAN. Now, if they did that, even if they count these excessive salaries in as part of the cost, the Government is still ahead 75 per cent upon the amount of the decrease?

Maj. BROWN. Yes, sir.

The CHAIRMAN. Whereas, if those salaries were not counted in, the Government would still further profit?

Maj. BROWN. That is the idea exactly.

Senator NEW. Does the finance division require the contractors to keep the costs of the individual parts or assemblies of parts?

Maj. SMITH. Yes, sir; we have insisted that they do that, but we have not been wholly successful up to date in getting them to do it.

Senator NEW. For what reason are the costs of parts under assembly necessary?

Maj. SMITH. Such costs are very necessary, to enable the director of purchases to efficiently purchase, and ultimately to either buy his

parts, on a fixed-price basis, or to establish a satisfactory bogie price for spare parts if bought on a cost-plus basis.

Senator NEW. Have you experienced any difficulty in securing such part costs of airplanes and motors?

Maj. SMITH. Yes, sir; we have.

Senator NEW. To what do you attribute your trouble in obtaining such part costs?

Maj. SMITH. It appears as though the contractors have felt that it would not be particularly to their advantage to have us obtain the full details of these costs, as without them the Government would not be able to make new contracts at reasonably low prices, either for fixed amounts or bogie prices for cost-plus contracts. In other words, if we have no details, the Government is at the mercy of the contractor to a great extent as regards the prices to be paid, if we are forced to rely on the contractor's estimates.

Senator NEW. Do you think the keeping track of part costs tends to retard production and to increase expense?

Maj. SMITH. Quite to the contrary. Any efficient up-to-date manufacturing plant has to institute what is generally known as a planning department, from which are issued production orders for each part and for each operation on each part, and the obtaining of the part cost, does not add to that work. Without production orders on parts and operations, it is practically impossible to keep track of production and operate efficiently in any manufacturing plant.

Senator NEW. Have you any knowledge of the methods followed by the Navy Department in connection with part costs?

Maj. SMITH. The Navy Department methods are practically parallel with ours. Within the last few days we have had a meeting with them and have gone over and compared our methods and the Navy thoroughly concurs with us in the need for part costs and the great hardship worked on the Government by the lack of them.

Senator NEW. Has the Government been able to reduce the purchase costs of spare parts in any large amount by securing detailed information from the contractors?

Maj. SMITH. Yes, sir; they have in a considerable number of cases. The Government has saved large sums where proper part costs were available.

Senator NEW. Have changes in the design of Liberty motors on airplanes been very considerable in number?

Maj. SMITH. Yes, sir; they have been very large, in numbers, necessarily so, from the fact that the Liberty motor was new, and practically all of the planes have been new.

Senator NEW. Has any record been kept of these changes, including the origin, the nature of them, and the cost, etc.?

Maj. SMITH. Yes, sir. As regards the Liberty motor, a very complete record has been made of each change, on a form prepared for that purpose, put into general use by a general order by the Signal Corps, No. 58, dated November 23, 1917.

Senator NEW. Describe the method followed in keeping track of and recording the costs and changes in the Liberty motors.

Maj. SMITH. If I may in that connection, I should like to read a letter prepared for the Department of Justice on the same subject within a week. They have asked the same question.

The CHAIRMAN. That is, within the present week?

Maj. SMITH. Yes, sir. This letter which I will submit is addressed to Mr. C. E. Coffey, of the Department of Justice, and is dated June 15, 1918.

(Letter referred to is here printed in full, as follows:)

BUREAU OF AIRCRAFT PRODUCTION,
June 15, 1918.

Commanding Officer, Approvals Department.

Mr. C. E. Coffey,

Room No. 102, Department of Justice, Washington, D. C.

Changes in specifications or design (airplanes and motors).

1. Pursuant with your telephone request of this date for advice regarding the method followed in the allocation of cost of changes in specifications or in design or both on airplanes and motors, on contracts originally placed by the Signal Corps, and still in force, would advise as follows:

2. Article VI, paragraph No. 7, of the standard form of Signal Corps cost-plus contract, contains the following sentence:

"In case the actual cost shall be increased by reason of changes in the specifications as in Article X hereof provided, * * * the total amount of increase * * * shall be deducted from the total actual cost; and the total amount of decreases in the total actual cost due to changes in the specifications shall be added to actual cost."

3. To properly record and handle the cost of such changes as might be originated, either by the production engineering department of the Signal Corps or by the contractors themselves, a form upon which such changes were to be initiated was prepared under the direction of then Prof. Roe, now Capt. Roe, together with instructions as to its use, and same was put into effect by Equipment Division executive order No. 58, dated November 23, 1917, and a copy of which is hereto attached.

4. Changes in specifications or design usually contemplate—

- (a) Elimination of a part without substitution,
- (b) Addition of a part where none had previously been used,
- (c) Substitution of one part for another, in which case the part substituted may be already in use, or of an entirely new design,
- (d) Division of a part into one or more constituent parts,
- (e) Combination of parts,
- (f) Alteration of parts,

and such changes are usually the result of experience obtained, either in process of production or in flying or sand tests, if it be planes, or in block tests if it be motors, made under the direction of technical attachés of the Signal Corps.

5. In the case of the Liberty motor the volume of changes, large and small, initiated by the various technical representatives of the Signal Corps and also the various contractors manufacturing these motors, was so great, and these changes followed so closely upon each other, that it was physically impossible for either the contractor to submit in due form or the representatives of the finance department in the field to accurately and intelligently approve the cost of each change and arrive at a determination as to its application under Article VI, paragraph No. 7 of the cost-plus contract.

6. Up to this time none of the Liberty motor contractors have submitted any claims on account of changes resulting in an increased cost which would entitle them to especial consideration under the terms of the contract, although it has been intimated to some of our field men that such claims would eventually be forthcoming.

7. In the case of De Haviland 4 air planes, there were no complete bills of material, specification, or files of suitable drawings available to give contractors, when orders for these planes were placed, and all of the early planes of this type, as well as practically the entire production thus far, was predicated as to design and construction upon an original sample brought from across seas.

8. The changes made in design from the original sample to suit American materials and American ideas on production have in the main originated from the contractors themselves with such additions as came from the Signal Corps engineering staff and all of which were passed upon and approved by the engineering department.

9. In view of these facts a complete record of changes, or departures from the original sample, such as was made in connection with Liberty motors, has not been and necessarily could not have been kept in proper form and the bills of material, when finally issued, will incorporate the latest practice on the De Haviland, resulting from the consensus of the combined Signal Corps' and contractors' experience in test and production.

10. The cost of all changes, both on—

- (a) Liberty motors

(b) and De Haviland 4 air planes
has entered directly into the cost of production, represented by—

- (a) Productive labor
- (b) Productive material
- (c) Overhead expense

and contractors have been reimbursed, upon their submission of properly supported vouchers, with the official approval of same by resident representatives of the finance department, in full for these expenditures.

11. In view of the fact that contractors have been fully reimbursed for their outlay to date under these cost-plus contracts, the matter of whether or not the "bogie" price will be affected by changes made in specification or design during the process of production is something for future determination and not a vital issue at this time.

12. In closing we are firmly of the opinion, in view of the high bogie prices in both the Liberty motor and De Haviland 4 contracts, very few of the contractors will either care to make claims, or be able to support claims if made, that will involve any material change in the compensation to be exacted from the Government. In fact, we believe it is more likely that a revision of bogie prices downward will be made before the completion of the several contracts.

13. If any additional data in connection with this matter is needed, please advise and we will compile and present same promptly.

By authority of the Director of Aircraft Production.

FRANK E. SMITH.
Major, Signal Corps.

Senator NEW. Once more, as a matter of inference, it would seem, then, from this last statement that, in your judgment, the bogie price of the Liberty 12-cylinder motor is high. Do you think that is the case?

Maj. SMITH. Yes, sir; it is unquestionably the case, Senator.

Senator NEW. Can you give us the cost of the Liberty 12 as compared with the bogie price?

Maj. SMITH. Yes, sir. I will submit a cost survey of the 12-cylinder Liberty motor made at the Packard plant on March 22, 1918, as follows:

(The document referred to is here printed in full, as follows:)

COST SURVEY LIBERTY 12 MOTOR.

<i>Made at Packard Motor Car Co.</i>		MARCH 22, 1918.
1. Direct cost:		
(a) Material.....	\$1,300	
(b) Labor.....	500	
(c) Total productive cost.....	\$1,800	
(d) Overhead expenses (200 per cent labor).....	1,000	
(e) Total shop cost.....		\$2,800
2. Miscellaneous cost:		
(a) Special tools and equipment.....	125	
(b) Contingencies (including cost of specification changes).....	275	
(c) Total estimated miscellaneous costs.....		400
3. Total cost per motor (per survey and estimate).....		3,200
4. Profit:		
(a) Fixed under present contract.....	625	
(b) Estimated saving under "bogie" price:		
1. Present bogie price.....	\$5,000	
2. Total estimated cost.....	3,200	
3. Total saving under bogie.....	1,800	
4. Contractor's share of 25 per cent.....	450	
(c) Total estimated profit to contractor (33.6 per cent).....		1,075
5. Total estimated cost to Government.....		4,275

Senator NEW. Have you any figures on the cost of the De Haviland 4 airplane?

Maj. SMITH. Might I mention, Senator, the number of Liberty motors contracted for?

Senator NEW. We have that, but you might state it for the purpose of this record.

Maj. SMITH. The total number of Liberty motors contracted for up to this date (12-cylinder motors) is 22,500 plus an equivalent in spare parts of 16,140 motors or a grand total of 38,640 motors.

Senator NEW. Have you any figures on the cost of the De Haviland 4 planes?

Maj. SMITH. The De Haviland 4-plane, as previously stated in my testimony, was brought here as a sample and dropped in the Dayton-Wright factory to be duplicated. There was a great deal of question as to what the Government should pay for it. The Government thought at one time that possibly they could make a fixed price, but had nothing to base fixed price on and had nothing to base a bogie price on, therefore our approvals department endeavored to arrive at some conclusion in connection therewith, by means of compiling the comparative cost of the De Haviland with the other planes made in this country. We decided that we could arrive at a reasonable conclusion by taking several types of planes and comparing them part by part, as to difficulty to produce and relative cost, and for that purpose asked that a board be allowed to go to Dayton and sit down and analyze the subject and arrive at a conclusion. Such a board went to Dayton and consisted of an engineer representing the approvals department, an accountant representing the accounts department, a captain representing the production department, and a special outside industrial engineer who had specialized in airplane parts, and who had made quite a careful study of the subject.

The CHAIRMAN. About when was that?

Maj. SMITH. This submission was made on February 14, 1918. The substance of that report was that the productive material in the De Haviland 4 airplane was \$1,804.14; that the productive labor on the basis of reasonable production of not less than 15 planes per day was \$630.63, plus such percentage of overhead expense as might be applicable to the factory in which the job was placed. Our investigators thought that 100 per cent overhead on this job would be sufficient on a basis of 15 or more planes per day, which made a total of \$630.63 per plane for overhead, or a total productive cost of \$3,065.40; to which they considered should be added a profit of 15 per cent, or \$459.81, bringing the total selling price to the Government, in their opinion, to \$3,525.21, which is approximately 50 per cent of the original bogie price stated in the De Haviland contract, of \$7,000 per plane.

Senator NEW. How many De Haviland 4 planes have you contracted for to date?

Maj. SMITH. There have been 8,500 De Haviland planes contracted for and 5,500 sets of spare parts, I believe.

Senator NEW. In a conversation that you and I had, Maj. Smith, the subject of the Le Rhone engine was mentioned. I wish you would tell us regarding how your cost survey of the Le Rhone motors compared with the bogie price mentioned in the contract.

Maj. SMITH. The original contract for the Le Rhone motor was placed with the Union Switch and Signal Co. of Pittsburgh, Pa., who are a subsidiary company of the Westinghouse Air Brake Co., at a bogie price of \$5,500 each. Our survey of that, which was submitted on June 21, was as follows:

COST SURVEY LE RHONE 9-CYLINDER ROTARY MOTORS.

JUNE 21, 1918.

Made at Union Switch & Signal Co.

1. Direct cost:		
(a) Material.....	\$432.07	
(b) Labor.....	379.67	
	<hr/>	
(c) Total productive cost.....		\$811.74
(d) Overhead expenses (200 per cent labor).....		759.34
		<hr/>
(e) Total shop cost.....		\$1,571.08
2. Miscellaneous cost:		
(a) Special tools and equipment.....	\$160.00	
(b) Spoilage (in overhead).....		
(c) Buildings (liberal depreciation).....	20.00	
	<hr/>	
(d) Total estimated miscellaneous costs.....		\$180.00
		<hr/>
3. Total cost per motor (per survey and estimate).....		\$1,751.08
4. Profit:		
(a) Fixed under present contract.....	\$687.50	
(b) Estimated saving under "bogie" price—		
1. Present "bogie" price.....	\$5,500.00	
2. Total estimated cost.....	1,751.08	
	<hr/>	
3. Total saving under "bogie".....	\$3,748.92	
4. Contractor's share of 25 per cent.....	\$937.23	
	<hr/>	
(c) Total estimated profit to contractor (92.8 per cent).....		\$1,624.73
		<hr/>
5. Total estimated cost to Government.....		<u>\$3,375.81</u>

NOTE.—Total order for Le Rhone engines is 2,500. The above cost was compiled upon a basis of the first 46 motors completed. The labor costs will be materially reduced when contractor reaches the point of producing motors at full capacity.

The CHAIRMAN. The fixing of the bogie price in the contract is subject to those deductions, when experience demonstrates that the bogie price is beyond the actual cost?

Maj. SMITH. Not in all cases.

The CHAIRMAN. In this particular case, does it?

Maj. SMITH. In this particular case the attention of this contractor has been called to the fact that the price is all out of proportion to the cost, and contractor has said that he would make a reduction, but I am simply giving you the facts as they exist on the face and in accordance with the letter of the contract.

The CHAIRMAN. Why was not that proviso inserted in all the contracts, if it became evident, from experience, under the contract, that the cost of production was away below the bogie price as fixed with the Government with the reductions that would be made?

Maj. SMITH. It should have been, but I can not answer why it was not done.

The CHAIRMAN. What proportion of the contracts did contain such a provision, if you can give it?

Maj. SMITH. I do not think very many of them did: My attention has not been called to many. There are a few. The De Haviland change was brought about by a complaint which originated from our approvals department.

The CHAIRMAN. Are those which contain such a provision among the latest contracts?

Maj. SMITH. I should say, yes, sir. There is another point that I would like to mention in connection with this Le Rhone engine contract, and that is that up to the time of the cost of survey but 46 motors had been completed, and therefore the labor cost is bound to be materially reduced when the Union Switch people finally get into production.

Senator NEW. For what purpose is the Le Rhone motor to be used?

Maj. SMITH. My understanding is that it is to be used for training purposes in this country.

Senator NEW. In training planes?

Maj. SMITH. Yes, sir; for advanced training purposes, I believe.

Senator NEW. You do not know the design of planes for which it is intended?

Maj. SMITH. Possibly Maj. Rose can answer that question.

Maj. CHARLES B. ROSE. I can not answer that, sir. I do not know.

Senator NEW. Maj. Smith, have you any other instances of excessive prices for motors or planes?

Maj. SMITH. I do not know that I can cite here specific instances with supporting details other than these various items which I have mentioned.

Senator NEW. Have you made any cost surveys of parts manufactured by outside vendors or subcontractors for Liberty motor contractors?

Maj. SMITH. Yes, sir; we have made some surveys of different things. We have here a survey submitted very recently, in fact, submitted on the 25th, in connection with aluminum pistons for Liberty motors, produced by the Aluminum Castings Co., of Cleveland, Ohio. I will submit the letter written by the man who made the investigation and reported upon it. The letter is dated June 25, 1918.

(The letter referred to is here printed in full, as follows:)

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
Washington, June 25, 1918.

From: Officer in charge, finance department, Detroit district.

To: Officer in charge, accounts section, Office of the Chief Signal Officer, 119 D Street, NE., Washington, D. C.

Subject: Investigation of the cost of aluminum pistons manufactured by The Aluminum Castings Co., Cleveland, Ohio.

1. Pursuant to your instructions, an investigation has been made by this office on the cost of the manufacture of Liberty engine pistons produced by the Aluminum Castings Co. at their N plant, Cleveland, Ohio. This plant started production of permanent mold castings on July 1, 1917, and our investigation covers its activities from that date to February 28, 1918.

2. *Costs.*—The pistons are sold to the Liberty engine contractors at \$3.34 f. o. b. Cleveland, Ohio, and the costs exhibited by the manufacturer's records, column A, indicate a loss of 23 cents per piston. An investigation of the books disclosed that the loss claimed was due to faulty accounting classification and our compilation of the data available, column C, shows that the billing price yields a profit of 58 cents per piston, equivalent to 21 per cent of cost, or 285 per cent per annum on the capital investment. (See par. 5.)

Cost per piston.

	A.	B.	C.	D.
	Costs per manu- facturer's unaudited records.	Deductions by Signal Corps. accountant.	Corrected costs.	Corrected costs adjusted to Government prices for metals.
Material.....	\$1. 5449	.....	\$1. 5449	\$1. 4070
Labor.....	. 7672	\$0. 3847	. 3825	. 3825
Overhead.....	1. 2556	. 4285	. 8271	. 8271
Cost.....	3. 5677	.....	2. 7545	2. 6166
Selling price.....	3. 34	.....	3. 34	3. 34
Loss.....	. 2277	.....	.....	.....
Total deductions.....	.....	. 8132	.....	.....
Profit.....	.....	.....	. 5855	. 7204

JUNE 25, 1918.

Officer in charge, accounts section, Washington, D. C.:

3. *Deductions by Signal Corps accountant, column B.*—On verifying the figures shown in column A, the items listed below, amounting to \$256,284.78, were found to be improperly included in costs; the inclusion of these amounts accounts for 81 cents, or the difference between a loss of 23 cents, as shown by the contractor's unaudited records, column A, and a profit of 58 cents per piston, shown in column C, corrected costs:

Capital expenditures.....	\$89, 147. 12
Die labor and materials.....	29, 064. 61
Productive labor not applicable to Liberty piston production.....	3, 083. 38
Advertising.....	72, 051. 05
Sales expense.....	12, 023. 19
Research expense not applicable to Liberty piston production.....	38, 478. 81
Commissions.....	9, 500. 00
Other overhead prorations.....	2, 936. 62
Total.....	\$256, 284. 78

4. *Cost with Government prices for metals, column D.*—In columns A and C the material costs were those furnished by the Aluminum Castings Co., which were in all instances in excess of the standard fixed prices established by the Government; column D is submitted as showing what the price of pistons would be, and should be, were the metals acquired at the Government fixed price.

5. *Production capacity and investment.*—The profit of 285 per cent on capital investment employed in Liberty piston production, column C, was based on an estimated production of 2,000 pistons per day, for 300 working days per annum, and a capital investment of \$122,000; the present contracts call for 240,000 pistons, or production at estimated capacity for 120 days.

6. The profit of 72 cents per piston shown in column D, based on Government fixed metal prices, would yield an annual return of about 350 per cent on capital investment.

PAUL B. HOLMES,
Captain, Signal Corps, United States Army.

Maj. SMITH. It is easy to figure out the saving on pistons for a 12-cylinder motor at 72 cents per piston, that is \$8.64 per motor. We have made numerous similar cost investigations with similar results.

Senator NEW. Have any considerable savings been effected for the Government by the approvals, property, and accounting officers stationed in the field and functioning on cost-plus contracts?

Maj. SMITH. Yes, sir; there have been.

Senator NEW. Can you give us any idea of the amount of those savings?

Maj. SMITH. Yes, sir. The savings effected by the finance division as a whole, covering the period of our activities from early last fall to the present time, aggregated over \$7,000,000, and we have shown in this report which I submit herewith, how they are made up in the main. It is rather a long statement and contains a large number of figures and it would be very much easier to show it to you gentlemen and have it put in the record.

(The statement referred to is here printed in full, as follows:)

Savings effected in fixed-price contracts.

	Quoted price.	Prices awarded.	Savings effected.
TRAINING PLANES AND MOTORS.			
Curtiss Aeroplane & Motor Corporation:			
1,400 JN4 planes.....	\$7,875,000	\$6,650,000	\$1,225,000
Spare parts.....	1,731,774	1,197,867	533,907
Willys-Overland Co.:			
5,000 0 hv 5 motors.....	11,875,000	9,750,000	2,125,000
Hall Scott Motor Car Co.:			
500 A7A motors.....	1,183,000	750,000	433,000
Spare parts.....	1,461,492	1,169,193	292,299
Standard Aero Corporation:			
100 I-1 planes.....	650,000	550,000	100,000
450 M. defense planes.....	2,115,000	1,563,750	551,250
MISCELLANEOUS SPARE PARTS.			
California Aviation Corporation.....	290,171	242,014	48,157
Engel Aircraft Co.....	645,275	585,077	60,198
Sturtevant Airplane Co.....	600,063	436,862	163,201
Thomas Morse Aircraft Co.....	123,545	99,987	23,558
Standard Aero Corporation.....	375,297	263,752	111,545
Total.....	28,925,617	23,258,502	5,667,115

MISCELLANEOUS SAVINGS EFFECTED.

Purchased by Government of plant of General Vehicle Co., Long Island; savings effected through investigation of approvals representative.....	\$140,000.00
Adjustment of claim made by Wright-Martin in connection with cancellation of 220-horsepower H-S motor, estimated savings.....	600,000.00
On proposed purchase of 75,000 Edison storage batteries, approval section obtained a reduction in price of \$3.13 per battery: savings.....	234,750.00
Adjustment effected in connection with Trego Motors Co.: contract: subcontractor charges excessive: savings effected by representative of approval section.....	1,726.00
Settlement and adjustment of cancellation of 3 contracts for heliograph with L. S. Batch Supply Co., Electric Dental Manufacturing Co., Julian P. Frieze Co.: approximate saving.....	20,000.00
Adjustment and settlement of cancellation of J. G. White Engineering Corporation order with United States Ball Bearing Co.: savings effected.....	10,514.89
Reduction in price of DII-4 landing gear axles from \$62.50 each to \$38: saving on 1,000 planes.....	24,500.00
Savings effected at Elizabeth in connection with building for teco purposes: contracts proposed subletting on cost-plus to cost approximately \$75,000: representative of approval section effected a contract to be let at fixed price of \$39,000: saving.....	36,000.00
Miscellaneous savings effected by various approval officers at plants of contractors compiled from report.....	500,000.00
Total miscellaneous savings.....	1,567,490.89

SUMMARY.

Savings effected in fixed-price contracts.....	\$5,667,115.00
Total miscellaneous savings.....	1,567,490.89
Grand total.....	7,254,605.89

The CHAIRMAN. Have you made any estimate of the actual cost, or any difference between the actual cost of the Hispano-Suiza motor and the bogie price?

Maj. SMITH. We have been getting to that point. In the first place, we had to take inventories at the Wright-Martin plant following a cancellation of a 220-horsepower contract, and that has been done and adjustment made and a big saving has been effected, and we are now engaged in making a cost survey of those motors, which will be ready shortly. There are some big contracts about to be made with the Wright-Martin people. The director of purchases is negotiating same to-day.

Senator NEW. Has there been any friction between the contractors and the finance division in the ordinary course of their duties?

Maj. SMITH. Yes, sir; there has been some friction.

Senator NEW. Has it been confined to any plant or group of plants?

Maj. SMITH. It seems to have been quite generally confined to the plants of the aeroplane manufacturers, as differing from the motor manufacturers.

Senator NEW. To what do you ascribe that?

Maj. SMITH. It seems to be the general objection to financial supervision by our officers of those organizations that were not perfected prior to their present contracts or are still in an unperfected state; also objections on account of restrictions put around the contractor by us in connection with their purchasing and their spending of large sums of money for facilities; restrictions on their payments for labor, including large salaries. Those seem to be the chief causes.

Senator NEW. Has there been any concerted action on the part of the motor or airplane contractors that is or has been apparent to you?

Maj. SMITH. There seems to be, at various times, quite a concerted attitude on the part of the airplane manufacturers. Such concerted actions have shown themselves in various ways.

Senator NEW. In what manner has it been evidenced to you?

Maj. SMITH. Well, one of the first and early evidences was this cross-licensing agreement, regarding which Maj. Downing has testified. That seemed to be an evidence of concerted action, although there has been something said here to-day to the contrary. In any event it was evidence to us of concerted action. The manufacturers have also held weekly meetings of the Manufacturers' Aircraft Association, usually followed by some similar demand on the part of all the contractors, as, for example, their concerted demand that we do not get part costs; that is, cost of the various components of the airplane; also a general claim on the part of airplane manufacturers; that is, I believe, outside of the Fisher Body Co.—we found that the Fisher body did not enter to any extent into this campaign—that governmental restrictions retarded production; lack of desire to secure part costs; claim that the nonpayment of vouchers presented by contractors for what we considered to be uncompensable items, have prevented the contractor from keeping himself properly financed, and thus the vendors have been compelled to wait on the payment of bills for materials sold, and the financial standing and credit of the contractor has been affected and he has suffered in his credit rating, with the result that shipment of materials have been held up and production has been retarded. These things seemed to

crop out all at once. It seems to be concerted. It seems to preface the visit to Washington of all the airplane manufacturers. Those things have happened right along.

Senator NEW. Is there any other specific reason existing, in your opinion, for this attitude on the part of some of the contractors toward the work of the finance division?

Maj. SMITH. Yes, sir. I think that the contractors feel, that if they can secure at this time a fixed price based on costs obtained under cost-plus contracts, and which must be considered in the aggregate, rather than in detail carefully analyzed, they will be getting very high prices for their new products, these prices having been predicated upon an experimental stage of manufacture and necessarily very high.

Senator NEW. What is your opinion of the cost-plus form of contract as compared with the fixed-price contract?

Maj. SMITH. It seems to me that the cost-plus form of contract is absolutely necessary under present conditions, for the reason that none of our product has been so standardized up to the present minute, and excluding, perhaps, the Liberty motor, as to warrant the placing of a fixed price upon it.

The CHAIRMAN. The labor market has something to do with it, has it not?

Maj. SMITH. I was coming to that, sir. The element of unrest in labor and fluctuations in material and the general changing conditions, make it almost impossible for a contractor to accept the hazards of a fixed-price contract unless it be at a price that is very disadvantageous for the Government to enter into. In other words, a "fixed" price if set, must be so high, as to protect a contractor from these several and varied contingencies, or the Government must assume the increased charges for materials or labor, which may develop, and that makes it necessary for the Government to assume the same supervision over fixed-price contracts, as they are now assuming in connection with cost-plus contracts, and, if anything is lost due to advances in material or labor, the Government loses it, while the contractor is whole at all times. Under existing conditions, I believe that cost-plus form of contract is the best form for the Government and should be continued until our design and production methods are more nearly standardized.

Senator NEW. Then, you consider the cost-plus form is the best for the Government and all parties concerned at this time?

Maj. SMITH. Yes. Furthermore, the Signal Corps form of cost-plus contract is an improvement over the usual type of cost-plus contract, in that it provides an increasing rate of profit dependent upon efficiency and low costs, and a decreasing rate of profit for inefficiency in proportion to high costs. Therefore, the Signal Corps form is better than the ordinary form of cost-plus contract in our judgment.

The CHAIRMAN. We were informed when in Detroit by the authorities at the Packard plant, that quite a number of enlisted men or soldiers had been detailed to work in their factory upon the Liberty motor, but that their compensation as soldiers was the only compensation which they obtained, namely, \$30 a month. Do you know anything about such a detail of enlisted men as that?

Maj. SMITH. Yes, sir; but you are misinformed as to their compensation.

The CHAIRMAN. Is it a fact, then, that they have been so detailed?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Why could they not be paid the equivalent of the wages received by civilians in similar employment?

Maj. SMITH. When that matter first came up the production of Liberty 12 motor tools was suffering, due to lack of competent toolmakers. In other words, there were not toolmakers enough in Detroit and the immediate vicinity to take care of the manufacture of tools for the Liberty motors. The fact of this shortage of skilled toolmakers seemed to make it necessary, in fact imperative, for us to go into the conscript camps and take out such men as had been drafted, who were competent, high-class toolmakers. These men were brought to Detroit to be used for the period of that particular emergency, and were allowed pay and commutation of quarters which gave them almost \$90 per month. This was the original plan on Liberty tool work, and it was realized at the time, that these men should have more compensation, if possible, as they were working beside men making \$1 an hour or thereabouts, but none of our legal talent could tell us how it was possible for an enlisted man in the Government service to receive more than the Government's pay and commutation for quarters; that is, enlisted men under the law could not receive pay from two masters.

The CHAIRMAN. That is, not without additional legislation?

Maj. SMITH. Yes, sir. The only solution seemed to be at that time—and I happened to be in Detroit when same came up—was to consider some sort of a "welfare" allowance for these men, who were quartered in Detroit, which would compensate them, in some measure at least, for the difference between the wages being paid civilian toolmakers and the compensation of enlisted toolmakers, and we agreed that we would allow the contractor—Packard Motor Car Co.—during the period of this particular emergency to pay as a "welfare" expenditure the keep of these men thus quartered in Detroit, as an element of expense under the cost-plus contract, so that the money that the enlisted men received from the Government was clean and clear, their keep being paid outside same. In other words, we allowed that expense as an element of cost under the heading "welfare" work for the emergency period.

The CHAIRMAN. Was that satisfactory to the men?

Maj. SMITH. Yes, sir; as far as I have heard.

The CHAIRMAN. Do you not think that this class of men, experienced toolmakers, should be permanently removed from the ranks of the Army and detailed to work in the shops at the present time?

Maj. SMITH. Either that or the other toolmakers in the shops should be conscripted and placed on the same basis.

The CHAIRMAN. Can not these experienced toolmakers who are detailed temporarily from the ranks to meet an emergency serve the Government by being permanently detailed from the ranks during the war?

Maj. SMITH. I would say yes.

We had the same difficulty with the employment of enlisted men in the spruce production on the coast. We had to camouflage an extra payment to them, as in the Packard plant, and it has been the

subject of investigation and criticism by the Inspector General's Department.

The CHAIRMAN. That is my conclusion. Now, in reference to another subject, and then I think I am through. Major, we received complaints at the Farmingdale factory of the Breese Aircraft Co., on Long Island, the other day, from the man in charge of the production of Penguin planes regarding the constant discovery of defects of various kinds in the Lawrence motor furnished for the equipment of those planes by the Excelsior Motor Co. of Chicago. They said that their complaints to the Excelsior Co. beginning sometime last spring and for some weeks afterwards, were made without avail; that the Excelsior Co. paid no attention to them, and afterwards they seemed to rely or trusted upon their right to rely, upon Government inspection made in Chicago. We were told that these motors were inspected by the Government before being shipped, and, if that is the case, then the inspectors at the Excelsior Works are either very careless or very incompetent, or both. Do you know anything about complaints regarding the quality of production at the Excelsior Co.'s plant?

Maj. SMITH. That is a matter that is outside of my province. I do know that there have been some complaints, but those matters are in the hands of the production and inspection departments.

The CHAIRMAN. Then, in order to ascertain the facts from the Government's standpoint, we had better hear the head of the inspection department?

Maj. SMITH. Yes, sir; unless Maj. Rose can answer your question.

Maj. ROSE. I am not entirely enlightened on the recent complaints, because I have not been in close connection with the inspection end for some little time, but there were a number of troubles in the motor, in the design principally, which were afterwards supposedly rectified. A man by the name of Cole has been looking after that motor in detail, the work being handled through the Chicago district office, and I think that they can give you some very definite information in regard to it.

The CHAIRMAN. Who is the head of the Chicago district office?

Maj. SMITH. It is a civilian who has been recently ordered to Washington. His name is Paul Benedict, now stationed at Four-and-a-half Street and Missouri Avenue, at the Bureau of Aircraft Production offices.

Senator FRELINGHUYSEN. Are you familiar with the financing of the Lincoln Motor Co.?

Maj. SMITH. I am familiar with it in a measure, but have not the details before me, therefore, I will ask Maj. Brown to answer that question.

Senator FRELINGHUYSEN. Maj. Smith, you can answer this part of the question, at least. Did Col. Montgomery's concern ever have anything to do with the financing of the Lincoln Motor Co., or its promotion?

Maj. SMITH. I do not know.

Senator FRELINGHUYSEN. Do you know, Maj. Brown?

Maj. BROWN. I think not. I have heard nothing to indicate it and I think if there had been I would have heard it. There has been no talk nor any other intimation of Col. Montgomery's connection with the Lincoln Motor Co. financially. Answering Senator Fre-

linghuysen's question as to the Government's financing of the company, on December 10, 1917, the War Credits Board, authorized an advance of \$5,000,000 to the Lincoln Motor Co., of which \$4,000,000 was actually advanced on that same date and \$1,000,000 on January 23, 1918. Later on, on March 15, 1918, a further advance of \$1,500,000 was authorized by the War Credits Board, payment of which was made in three separate installments of \$500,000 each; on March 18, 1918, March 23, 1918, and April 6, 1918, making a total advance to the Lincoln Motor Co. of \$6,500,000, of which they have repaid \$92,160, leaving, including interest accrued, an unpaid balance due of \$6,511,509.13; this statement as of May 31, 1918.

The CHAIRMAN. Do you have a record of the motors finished and delivered by the Lincoln Co.?

Maj. BROWN. No, sir. We have a record of what they contracted for, but not of deliveries. I might state—I do not know that this has anything to do with their financing, but it is in regard to financial aid to the Lincoln Co.—that we have pursued the same practice with the Lincoln Co. as with the Standard Aircraft Corporation. We have made payments on estimated vouchers for materials and labor, both direct and indirect and for overhead, to the extent of a million and a half dollars a few weeks ago and \$875,000 this week. These vouchers will be verified to actual figures as their accounting department is able to give us the actual figures. Their accounting department is in much better shape and far superior to the Standard Aircraft Corporation, and we have had none of the difficulties with that organization as with the Standard Aircraft Corporation. Mr. Leland is very appreciative of everything that we do to aid him, whereas in the case of the Standard Aircraft Corporation the reverse seems to be true.

Bureau of Aircraft Production, finance division, reimbursements to contractors on public vouchers approved by accounts department for United States Army standard (Liberty) 12-cylinder engines as of July 17, 1918.

Contractor.	Contract No.	No. of voucher sub- mitted.	Total engines.	Engines shipped.	Balance.
Ford Motor Co.....	2129	21	5,000	53	4,947
General Motors Corporation (Buick) ¹	2266	5			
General Motors Corporation (Cadillac).....	2266	18	2,000	65	1,935
Lincoln Motor Co.....	1647	54	6,000	645	5,355
Nordyke & Marmon Co.....	1704	117	3,000		2,900
Packard Motor Car Co.....	1646	134	6,000	1,626	4,374
Treco Motors Corporation.....	1648	85	500		450
		434	22,500	2,389	20,111

Factory cost.

Contractor.	Direct labor.	Direct material.	Overhead expense.	Total cost.
Ford Motor Co.....	\$11,146.55	\$1,208,526.84	\$300,458.83	\$1,520,132.22
General Motors Corporation (Buick).....		218,107.59	26,550.91	244,658.50
General Motors Corporation (Cadillac).....	39,470.70	405,621.43	74,745.18	519,837.31
Lincoln Motor Co.....	300,929.97	3,285,449.92	835,023.36	4,401,403.25
Nordyke & Marmon Co.....	71,182.72	1,274,993.06	568,048.77	1,914,224.55
Packard Motor Car Co.....	786,723.00	3,655,622.36	951,801.27	5,394,146.63
Treco Motors Corporation.....	77,116.16	320,528.27	315,853.34	713,497.77
	1,286,569.10	10,348,849.47	3,072,481.66	14,707,900.23

¹ Spare parts only.

Bureau of Aircraft Production, finance division, reimbursements to contractors on public vouchers approved by accounts department for United States Army standard (Liberty) 12-cylinder engines as of July 17, 1918—Continued.

Contractor.	Miscellaneous cost.			Total cost.	Profit payments.	Grand total expenditures.
	Special tools.	Increased facilities.	Miscellaneous.			
Ford Motor Co.....	\$23,660.67			\$23,660.67	\$33,125.00	\$1,576,917.89
General Motors Corporation (Buick).....	16,304.59	\$149,705.43		166,010.02		410,668.52
General Motors Corporation (Cadillac).....	257,713.47	751,993.35		1,009,706.82	40,625.00	1,570,172.13
Lincoln Motor Co.....	941,202.93			941,202.93	403,125.00	5,745,731.18
Sprague & Marmon Co.....	404,869.23	938,184.80		1,343,054.03		3,257,278.58
Standard Motor Car Co.....	278,646.33	618,061.74	\$158,762.94	1,055,471.01	1,016,250.00	7,465,867.64
Truett Motors Corporation	151,217.12		¹ 1,402.48	149,814.64		863,312.41
	2,073,614.34	2,457,948.32	157,360.46	4,688,923.12	1,493,125.00	20,889,948.35

¹ Miscellaneous revenue.

Senator NEW. I would like Maj. Rose to take the stand.

STATEMENT OF MAJ. CHARLES B. ROSE.

Senator NEW. Please state your full name.

Maj. ROSE. Charles B. Rose.

Senator NEW. What is your rank?

Maj. ROSE. Major, Signal Corps, United States Army.

Senator NEW. How long have you been in the service of the Signal Corps?

Maj. ROSE. I came down here in the early part of September, 1917. I was commissioned as captain in the Reserve Corps on September 29, 1917, and promoted to major in the fore part of February of this year, 1918.

Senator NEW. What is your present connection with the Bureau of Aircraft Production?

Maj. ROSE. I have been detailed to look after and endeavor to aid and help in the production of airplanes at the Standard Aircraft Corporation at Elizabeth, N. J. I have been at that plant now for about four weeks.

Senator NEW. What, in your judgment, is the chief cause of the failure in the production of aircraft?

Maj. ROSE. There are probably a great many reasons for that. One reason that I would give is the fact that in some cases good judgment has not been used in placing the orders for these air planes. For example, the Standard Aircraft Corporation to-day have orders for 6 different types of planes that vary widely in their design. They have orders for De Haviland fours, "H.-S.-1-L." boats for the Navy, "J.-R.-1-B.," which is an advanced type of training plane for the Army. They have orders for 10 boats for the Japanese Government and about 10 boats for our Government, 4 Capronis, Handley-Paige, and the E-1 or M defense, as it is called. Those planes vary from a small advanced type of training plane to the very largest type of plane, the Handley-Paige and the Caproni. That divides the organization in six different directions, and that organization is inefficient to start with, and they are not familiar with quantity manufacture,

and when you divide that organization into those six different directions you are not going to get anywhere near efficiency, in my opinion.

The CHAIRMAN. That answer is confined to one plant of one company. I understood the Senator's question to be general.

Senator NEW. That is true. That is what appears to be wrong with the Standard Aircraft Corporation. Tell us about the matter as a whole.

Maj. ROSE. Well, another reason for the general lack of efficiency, in a great many cases, in my opinion, is due to the fact that orders have been placed with organizations who do not understand quantity manufacture. Where the orders have been placed with people who have been accustomed to large production they seem to be getting into production. I speak principally of the Dayton-Wright and Fisher. The Fisher Body Co. are good manufacturers, and the Dayton-Wright are fairly good, in my opinion, but the old aircraft people, who have been accustomed to manufacturing airplanes in small quantities do not seem to know how to develop an organization to carry on a large production.

Senator NEW. Have you various people in charge of aircraft production in the Signal Corps, who have been qualified in the past to properly handle the work in an efficient manner, based on their training and experience prior to the war?

Maj. ROSE. I think not, sir. I do not think their training prior to the war shows that they are qualified to handle the work.

Senator FRELINGHUYSEN. Does the same lack of organization exist in the Curtiss plant as in the Standard?

Maj. ROSE. I am not thoroughly familiar with the Curtiss organization, Senator. I can only give it from hearsay, but I understand that there is a lack of organization at the Curtiss plant.

Senator FRELINGHUYSEN. Might not that lack of organization be due to the numerous changes in type and the confusion caused by the vacillation of the Government engineers, and changing the designs?

Maj. ROSE. That has evidently contributed to the lack of organization very greatly.

Senator FRELINGHUYSEN. Has the fact that they have had limited orders, or a small amount of orders, given them in comparison with these other factories, prevented them from enlarging and perfecting their organization?

Maj. ROSE. In my opinion, an organization should have good-sized orders to work on, in order to develop a proper organization and to buy material in quantities large enough, so that they can be bought economically. The contractor should also be given notice far enough in advance so that he can develop the organization, get in materials, build jigs, tools, and dies, and go ahead with the work preliminary to production. For an airplane such preparation takes some time, and it would seem to me that the policy ought to be that we would determine on the types of planes that we wanted to build, and give the manufacturers notice of that and let them go ahead and build those planes as rapidly as they possibly could, and on a cancellation they should have sufficient notice, so that they could clean up their stock and get into something else without great loss of time or money. That would greatly aid in the production of airplanes, in my opinion.

Senator FRELINGHUYSEN. I understood from the engineer in the Standard plant that there were four agencies in Washington in control of production. Is there duplication of supervision of production in Washington at the present time?

Maj. ROSE. Yes, sir; there is.

Senator FRELINGHUYSEN. What are the agencies in control of it?

Maj. ROSE. Col. Hall has been given charge of the engineering and inspection and production of a certain number of De Haviland four planes in each plant. Col. Hall has an organization of his own. He has some men in the Standard plant to-day.

The CHAIRMAN. Does that not comprise also production of Bristol planes at the Curtis plant?

Maj. ROSE. Yes, sir. The production department in Washington also has jurisdiction over the proposition. I have been detailed to the Standard plant to handle the production and engineering and inspection at that plant. There is a duplication between Col. Hall's work and the work of the production department at Washington, but that has not caused the Standard Co. any trouble. I can not say as to the other companies. It has caused the Standard Co. no inconvenience whatever.

Senator FRELINGHUYSEN. I hold no brief for the Standard Co. because they are in my State. I am very anxious, however, that they should do their work efficiently. Do you not believe that it would be a good plan to place the control of the production of these types of machines that we are building under the control of the men who have designed them and built them, rather than under our own engineers and designers?

Maj. ROSE. No, sir; I do not believe it would be.

Senator FRELINGHUYSEN. Why not?

Maj. ROSE. I will tell you why. The English methods of manufacture are quite different from ours. The Englishmen are accustomed to very much more handwork in all their manufactured articles than we are. Our methods are to jig up and tool up, so our production will run through almost automatically, and the Englishmen have not developed up to that point. If you brought a man from the Handley-Page plant in England and put him in here to handle our workmen with our methods, I do not believe it would be satisfactory.

Senator FRELINGHUYSEN. Does the same condition occur in connection with the Capronis?

Maj. ROSE. Yes, sir; it does. I am quite intimately acquainted with the Italians, Capt. De Annunzio and Lieut. Belloni, and these Italian officers who are over here are working at a great disadvantage and are very temperamental and are very hard people to handle.

Senator NEW. I want to ask Maj. Rose one further question. It has been stated by the Standard Co. that the interference on the part of the finance division has tended to restrict and retard production. I want to know if, in your judgment, there is any substantial basis for that charge?

Maj. ROSE. In my judgment, that is not true. My experience with the finance division at the Standard Aircraft Corporation has been that they are endeavoring to cooperate in every way possible and ready to go to every end that they could to facilitate production.

Senator FRELINGHUYSEN. What do you believe ought to be done with the Standard plant at Elizabeth, N. J.?

Maj. ROSE. I have made two suggestions to the department. The first suggestion was that the Standard Aircraft Corporation be taken over in some form or other by the Government. The second suggestion was that some one in authority go to the backers of this company, who, I understand, are Mitsui & Co., and state the existing conditions in that plant and say that this was one of the four large aircraft-producing plants, and that something must be done to the management of that concern so that it would be put on a good manufacturing basis and produce airplanes.

Senator FRELINGHUYSEN. Have either of your suggestions met with approval?

Maj. ROSE. They have met with approval, I think, but with no action to date.

Senator FRELINGHUYSEN. To whom did you submit them?

Maj. ROSE. Mr. A. A. Landon and Lieut. Col. Mixter.

Senator FRELINGHUYSEN. Who is Lieut. Col. Mixter?

Maj. ROSE. He is my immediate superior, and he is directly under Mr. Landon. Mr. Landon has been newly appointed as director of production.

Senator FRELINGHUYSEN. Has this suggestion been presented to Mr. Ryan?

Maj. ROSE. I can not say.

The CHAIRMAN. Major, when the authorities here cancel an existing contract for an existing type of machine, or order suspension of production for the time being, that necessarily interferes with production, does it not?

Maj. ROSE. Yes, sir.

The CHAIRMAN. To that extent, then, whenever that occurs the authorities here are responsible for the stoppage of production?

Maj. ROSE. Yes, sir.

Senator FRELINGHUYSEN. Maj. Rose, can you furnish for the committee a complete statement of expenditures by the Signal Corps for all aviation equipment, aviation fields, engines, planes, supplies, etc., by contract with the various companies with whom you have contracted?

The CHAIRMAN. I put a statement of that kind in the Congressional Record about the 1st of April.

Senator FRELINGHUYSEN. I have not seen that statement, and what I want to obtain is this: The criticism that is made in this aircraft program is the fact that no one knows where the money has been spent and what results have been obtained. Now, if you can take an item and show that so much money has been spent for aviation schools, so much for construction, so much for the preparation of the land, so much for the purchase of machine guns, so much for the engines, and take the Lincoln motors contract as an illustration, the cost of the engines, and the profits, showing cost and profits to the Lincoln Motors Co., and following that system down through the statement, that statement will be, in my opinion, a comprehensive statement of the expenditure of the money.

Maj. ROSE. I could not answer that question.

Maj. BROWN. Information, Senator, of that character was furnished in detail at Mr. W. C. Potter's appearance before the House

Committee on Military Affairs, to Chairman Dent, a few weeks ago, and we could furnish copies thereof to you.

Senator FRELINGHUYSEN. That is sufficient.

Maj. BROWN. It does not include the element of cost per unit, to which facts Maj. Smith has just testified before this committee this afternoon. It does include disbursements divided according to the divisions we have indicated. Out of about \$750,000,000 of appropriations to the Signal Corps, up to May 1, 1918, we had expended about \$370,000,000. The balance is the unexpended portion of appropriations applicable to the payment of obligations incurred. All that detail is shown comprehensively.

Senator NEW. Since Maj. Smith left the stand he has shown me here a tabulated statement of a four weeks' pay roll at the Curtiss Co.'s plant and I would like him to present that and make some explanation of it.

Maj. SMITH. Senator Frelinghuysen asked about the efficiency of the Curtiss plant, and on my visit there in May, I looked into the pay roll for the previous month, a four-weeks period, during which time the productive labor as compared with the nonproductive was one-half of the nonproductive. In other words, the nonproductive was 200 per cent of the productive, which is very inefficient manufacturing. Also, during that period 29 boats and 1 Bristol airplane were completed in that plant. Investigating further I found that the prevailing labor rates at the Curtiss plant were in excess of labor rates paid workmen in near-by plants such as the Pierce-Arrow plant, and other plants employing similar classes of labor. Therefore, they were not only paying more for the labor but carrying a great many more men for the work.

Senator FRELINGHUYSEN. In other words, out of a \$653,000 pay roll there was a nonproductive cost of \$457,000, which certainly is a great loss in energy.

Maj. SMITH. This means that the nonproducers, who walked around and did not do a thing in the way of productive effort, were as two to one of the actual producers.

(Whereupon, at 5 o'clock p. m., the committee adjourned subject to the call of the chairman.)

(Smith to furnish table of 4-week pay roll at Curtiss plant. See pp. 56 & 57.)

AIRCRAFT PRODUCTION.

SATURDAY, JUNE 29, 1918.

UNITED STATES SENATE,
COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2 o'clock p. m., at the room of the committee, Capitol Building, pursuant to call of the chairman, Hon Charles S. Thomas presiding.

Present, Senators Thomas (chairman), Reed, New, and Frelinghuysen.

STATEMENT OF RICHARD HENRY DEPEW, JR.

Senator NEW. Mr. Depew, you, I believe, are an aviator?

Mr. DEPEW. Yes, sir.

Senator NEW. When and under what circumstances did you learn to fly?

Mr. DEPEW. I originally learned in 1911, in France, at the Maurice Farman School at Buc, France. I got my aviator's certificate there.

Senator NEW. You have handed me a certificate from that school showing that you hold license No. 641. Is that correct?

Mr. DEPEW. That is right, but that is not a certificate from that school. It is the International Aeronautic Federation, Aero Club of France, 641. I hold a yearly license card from the Aero Club of America, No. 5, for 1918.

Senator FRELINGHUYSEN. Let us develop the nature of that training in France.

Senator NEW. What is the nature of that French training?

Mr. DEPEW. I was first taken up for a number of lessons with an instructor and when I became competent, I was allowed to fly a machine alone, and after a certain amount of practice alone, I was allowed to make tests for my certificate, and then my training ended. I made one flight after that for my family, so that they could see me fly.

Senator FRELINGHUYSEN. Was that advanced training?

Mr. DEPEW. No, sir. Of course, the training then differed greatly from the development as it is now. Flights were shorter and the machines were nothing like those developed at the present time. A flight amounted to far more than it does at the present time. It was not the commonplace thing that it is now.

Senator NEW. Did you do any maneuvers, such as flipflaps?

Mr. DEPEW. No, sir; figure eights but no stunt flying at all.

Senator NEW. When did you come back to the United States?

Mr. DEPEW. In September, 1911.

Senator NEW. And when did you take up aviation over here?

Mr. DEPEW. I took up flying in May, 1917, but in January, 1917, I went with the Curtiss Aeroplane Co. and worked in the engineering department for about four months at Buffalo.

In the intervening years for several years I had studied up a great deal about the theory of aviation and followed aviation, although I was not actively engaged in it. I kept track of different ones who were flying and used to take all the magazines and read all the books on the subject.

Senator NEW. In what capacity? You say in the engineering department.

Mr. DEPEW. First as draftsman in the boat hull department, and then I was transferred to what was known as the change department. In the change department we took care of the necessary changes made in the different models. Sometimes the workmen would not follow the drawings, and in other cases the drawings were incorrect, and we would determine what the trouble was by going out and looking at the machines as they were built and straightening them out on what they were doing and making corrections.

Senator NEW. You were in the employ of the Curtiss Co. and not of the United States?

Mr. DEPEW. Of the Curtiss Co. I have never been in the employ of the United States Government.

Senator NEW. Did your employment cover any other capacities at later stages?

Mr. DEPEW. Yes; while I was still in the factory I took care of what they called engineering dispatching, that was getting up data when the drawings would be completed for certain new models, so that we could notify the production department that built the machines.

Senator NEW. Did you do any flying for the Curtiss Co.?

Mr. DEPEW. Yes, sir. Starting in May of 1917 I took a course of training at their field. I had to learn over, because I had been out so long. Following that I put in a good deal of time practicing flying alone. In October, 1917, I was sent by the company to the Officers' Training Camp at Plattsburg, at the request of the Government. They could not get Government machines, so one of the student officers up there offered to get the machines of the Curtiss Co. He formerly was connected with the company, and the company sent me for that purpose. I was there about a week and flew over the surrounding country and over their trenches—they had a system of trenches and had trench maneuvers. I took up observers, and they took a good many photographs of barracks, trenches, and of the surrounding country. I also did liberty loan work. From May until that trip to Plattsburg I was not receiving pay from the company. I was still practicing and getting in training, but I received pay from them for that trip, and when I returned to Buffalo I was around the factory and doing some flying in the field for practice but was not on the pay roll again until December.

Senator FRELINGHUYSEN. Did you fly from Buffalo to Plattsburgh?

Mr. DEPEW. No, sir; we shipped the machine up there. After returning from there I watched the new models being built and got a great deal of experience in that way. In December I was employed by the Curtiss Exhibition Co. and was sent to Newport News as

instructor, remaining there about three weeks. I was then transferred to the Curtiss Flying school at Miami, Fla.—owing to the closing of the school at Newport News—where I was an instructor in flying until the end of March. I returned to Buffalo early in April and became one of the test pilots—first assistant test pilot of the Curtiss Aeroplane & Motor Corporation and held that position until the 17th of June, when I resigned. That covers it to the present time. If you care to have it in the record, I will say I was the first to fly one of the Government mail planes (the Hispano-Suiza motored model), and I put it through its flying test at Buffalo, N. Y., before it was put in use between New York and Washington.

Senator New. You conducted that test?

Mr. DEPEW. Yes, sir; I superintended the assembling of the machine out on the field, and personally flew the machine at its final test. I also flew the day you gentlemen were out there at Buffalo, when you saw Rader fly.

Senator New. The committee is much interested in the structural characteristics of the various types of machines, particularly as they have a bearing upon the stability and safety of the machine, and it is therefore interested in hearing from you any suggestions that you may have to make concerning the structural weaknesses, or needed improvements, in machines now in process of production, based upon your own experience as a flyer, and your observations at the Curtiss factory. You may state to us, if you will, anything you care to say on those subjects.

Mr. DEPEW. Well, that is a pretty broad subject, but the two main points that I would like to touch upon are the Bristol machine and the new machine at Buffalo known as the Curtiss-Bristol—do you want my opinion about those?

Senator New. Yes; your information based upon your own experience and your own observations of it?

Senator FRELINGHUYSEN. This, of course, is confidential testimony.

Mr. DEPEW. The main work at the Buffalo field was to be the testing of the Bristol machines. There would be some other testing of course of various machines as they came through, but the main work was the Bristols.

My personal opinion is that the Bristol machine in its present form will not stand the strain of the Liberty motor—the 12-cylinder Liberty motor. This machine was designed for the Rolls-Royce motor, and I am informed by Capt. A. B. Rogers, who is an Englishman, that they never used a motor of over 275 horsepower in the original Bristol, but the Liberty motor developed around 400 horsepower; some were slightly over that. There are various points that I personally do not like about the machine. One is that I consider the landing wheels are placed too far back, giving the machine a tendency to nose over and make a bad landing. The installation of the tail-skid has never been satisfactory; the skids were breaking and the supporting tube bending.

Senator THOMAS. What was it made of?

Mr. DEPEW. The supporting tube is made of steel and the tail-skid is made of wood—ash, I believe. We had considerable trouble with those at the Buffalo field and reported it a number of times, and the factory said they were having no such trouble at Dayton. When the two Dayton flyers were brought to Buffalo—

Senator THOMAS. Could you give their names?

Mr. DEPEW. One was Phil Rader and the other was Eversole. In one landing Eversole broke the skid and at another time he nosed over breaking the propeller. I do not consider that any fault of his but it simply illustrates the fact that the machine is not arranged properly. We have a bad field in Buffalo anyway. There were a great many minor things that were reported to the factory from time to time that should have been attended to but were allowed to drag on. As an illustration—these are minor details but it shows the attitude of the factory—the rubber knob on the top of the control stick was insecurely attached. We reported on this and we made good the attachments on one of our machines at the field. A number of weeks later I noticed that it had not been changed on the production machines.

In April it was pointed out that there was no provision made to limit the travel of the axle of the landing gear in the event of the shock absorber rubber breaking. This is an important point, as we had several rubbers break but noticed it in time before they were entirely broken and we had no accident. However, the last time I saw the Bristols this was not fixed. It was pointed out as to the R.-4, L. M. mail carrying machines that the location of the hand-operated air relief cock was inaccessible to the pilot. Some weeks later the Bristol machines were sent to the field with the air relief cock changed to a new position, and the new position was also inaccessible. That will illustrate how they do things. One of the chief difficulties of the whole situation, as far as I was concerned, was that very little consideration was given to the suggestions and advice of their test pilots by the engineering department.

Senator NEW. Mr. Depew, did you ever call the attention of the Curtiss people to a structural weakness of the wings of the Bristol plane? I am referring now to the fact, or the alleged fact, that the linen covering of these wings was not properly put on so that it weakened and became loose?

Mr. DEPEW. Yes; we did.

Senator NEW. When did you call their attention to that, and under what circumstances?

Mr. DEPEW. Well, I have here some notes that I copied from our written reports from the flying field to the Engineering Department. These are not the complete reports, which I was unable to obtain, but I personally copied this from the reports.

The first is May 9. "There was observed some vibration of the fabric on the top of the upper wing; the tail surface vibrated some." May 16: "Fabric of the wings noted to vibrate out to 4 or 5 feet on either side of the fuselage." May 17: "It was noticed that when the motor was running full open throttle that the wing fabric vibrated excessively near the fuselage when struck by the propeller blast. The fabric of this area being ripped and torn back, it was found that the wing fabric had pulled away from the stitching binding it to the ribs."

Senator REED. Is this May just past or May a year ago?

Mr. DEPEW. This was this past May. The machine was carried back into the hangar and the wings taken off and sent back to the factory for repairs.

Senator THOMAS. This was on the Buffalo field?

Mr. DEPEW. On the Buffalo field. Then there is a note at the foot of that report saying:

The total flying time for this Bristol machine is only 36 minutes, of which time about 27 minutes only was with the motor wide open. The fabric pulled away from the ribs, both upper and lower wings. The bottom surface of the wing pulled away the most, but the top surface had started to pull away also. At one point not only were the stitches pulled through the fabric, but the stitches themselves whipped out and frayed. The wing stitching was not waxed. It was also observed that the dope apparently did not penetrate the cloth as it should.

I think it was before this last report, a day or two before, that a Bristol machine that had been sent to Dayton, Ohio, from our flying field was smashed up and the two men injured, owing to the cloth of the wings tearing.

Senator REED. You say about this time. Was it before or after the report?

Mr. DEPEW. I believe it was a day or two before.

Senator REED. Could you verify that and get the exact date?

Mr. DEPEW. I do not know whether I can or not. I am practically positive it was before this happened. I have left the company and it is difficult for me to get much more information, but I am practically certain it was a day or two before this. At the time that we had this difficulty with the second machine—that is what I have just given you, about taking off the wings and sending them to the factory—the machine was to be piloted by Roland Rohlf and I was the observer. We were sitting in the machine with the motor running, ready to go, when one of the mechanics noticed the trouble with the wing. That is how close we came to the same thing that happened on the day of the Rader accident.

Senator NEW. Pardon me for interrupting you. You say that is how near you came to meeting with the same fate.

Mr. DEPEW. Well, a very strong possibility of its happening.

Senator NEW. And you called the attention of the pilot to it then and it stopped the flight?

Mr. DEPEW. Yes, sir; I was sitting in the machine and banged him on the back. We had not left the ground. We were trying out the motor and it stopped the flight.

Senator THOMAS. Did you give the date of that?

Mr. DEPEW. Yes, sir; I gave the date; it was the 17th of May. As Rader was getting ready to make his flight with Mr. Robert Connor as observer, some others on the ground noticed the wing fabric vibrating.

Senator THOMAS. This was the same day?

Mr. DEPEW. The date of the Rader accident, June 10, 1918.

Senator THOMAS. The day he was killed?

Mr. DEPEW. Yes, sir. Rader's attention was called to this fact by Mr. C. W. Webster, but he decided to make the flight. He was up four minutes when the wing fabric on the left upper wing panel tore, causing the machine to get out of control and plunge onto the ground in a spinning nose dive. When the machine struck the ground the gasoline tanks burst and the machine was practically entirely burned.

Senator THOMAS. At this time did the machine which Rader flew carry what is called the military load?

Mr. DEPEW. I believe not.

Senator THOMAS. Was it equipped with guns?

Mr. DEPEW. It had the two machine guns in the front, but I believe the rear Lewis gun had been removed.

Senator THOMAS. I was told that it carried a full military load.

Mr. DEPEW. Well, it carried two guns on the front, but my impression is the Lewis gun had been removed from the cockpit and I believe it did not have the drums for the ammunition.

Senator THOMAS. Did it carry a photographic apparatus?

Mr. DEPEW. No, sir.

Senator THOMAS. Is it your opinion that the accident was caused by the condition of the covering of the wings?

Mr. DEPEW. I do not know why the covering ripped, but I know I saw, too, with my own eyes, that it did rip.

Senator THOMAS. You were looking at it at the time?

Mr. DEPEW. Yes, sir; I saw it.

Senator THOMAS. What was the height of the machine from the ground?

Mr. DEPEW. I would say between 700 and 1,000 feet.

Senator THOMAS. Did it go immediately up from below?

Mr. DEPEW. Yes, sir; of course, going more and more rapidly out of control as it dropped.

Senator THOMAS. What was the name of the observer who was killed?

Mr. DEPEW. Robert Connor.

Senator NEW. Do you think Rader was seeking to regain control of it as it fell?

Mr. DEPEW. Well, it would only be instinct to do all you could, but he was not able to retain control of it.

Senator REED. Was he an accomplished flyer?

Mr. DEPEW. Very skillful and very experienced.

Senator REED. Now, you have referred to two of these machines that developed this weakness. Were they made in the same manner as all other Bristol fighters; I mean was the construction the same upon those two machines as the construction generally employed upon the Bristol fighter?

Mr. DEPEW. The machine on which we noticed the covering coming loose from the wings was sent to the factory and modified at the factory. The wings were altered at the factory as follows----

Senator REED. After you sent them back?

Mr. DEPEW. Yes, sir.

Senator REED. Please notice the question I asked, and answer it. I am inquiring now whether the two machines which you have spoken of as having developed these defects that you have described, were of the usual type and class of Bristol machine which was being turned out at the Curtiss factory, or did they differ from the other machines in their make-up?

Mr. DEPEW. A great number of parts for the Bristol machines had been made and the machines held up for one reason or another in the factory. The first machine sent to the field caught fire on the ground and was burned. This was before I arrived in Buffalo. The second machine was flown at the field for some time and then shipped to Dayton, Ohio. It was upon this machine that the wing fabric tore at Dayton, causing the smash and injury of two men. The third machine sent to the Buffalo field was the one referred to above, where the cloth was seen to be coming loose from the wings by

Rohlf's and Depew. Various modifications and changes were made in these different Bristol machines so that they were not similar to each other in every respect. The alteration of the wings that were returned to the factory was as follows: Additional ribs were added from the inner end of the wing out to the intermediate struts. Veneer was added from the leading edge back to the front beam on both top and bottom surfaces from the inner end of the wing to the intermediate struts. Extra ribs and the veneer were added in similar manner to the engine section panels. This applies to both upper and lower wing panels.

Senator REED. Those were the changes that were made in the machine that you and Rohlf's found to be defective?

Mr. DEPEW. Yes, sir.

Senator REED. Let us follow that machine for a minute. When it came back to the field did you have any further trouble with it?

Mr. DEPEW. We noticed no further trouble from that standpoint of the wing fabric.

Senator REED. Did you have any trouble from any other standpoint?

Mr. DEPEW. Yes, sir; the tail skid continued to give trouble and the tail surface vibrated.

Senator REED. Now, as to that tail surface vibration, did that come from some cause similar to the thing that caused the vibration of the wings?

Mr. DEPEW. No, sir; it was merely the whole tail vibrating. A certain amount of it can not be helped.

Senator REED. But this was excessive?

Mr. DEPEW. Yes, sir.

Senator REED. What I am particularly trying to get at is whether the changes and alterations having been made in these wings, as you had suggested, the wings then appeared to be stable to do the business?

Mr. DEPEW. We had no trouble with the wings, and it was not noticed until after Rader's accident, when all flying was stopped on Bristol's and all wings taken back to the factory, that the covering of these wings showed slight points that were not satisfactory. It was not very great.

Senator REED. Now let us take up the machine that Rader was killed in. Was that machine a regular stock machine?

Mr. DEPEW. Well, there was no regular stock machine. It was a production machine, as built at that time.

Senator REED. Was it like the other machines being produced at that time?

Mr. DEPEW. At that time.

Senator REED. It was?

Mr. DEPEW. Yes, sir. Of course there were countless changes in the Bristol; I do not know how many; they were constantly changing things, but there were several built like it.

Senator REED. I think we have covered that point now.

Mr. DEPEW. I would like to give you, if you will let me, a little further data on that machine that Rohlf's and I were flying in.

Senator NEW. We would like to have it.

Mr. DEPEW. It was the idea of the engineering department to add only two extra ribs in each wing panel, whereas Rohlf's insisted on

having them run out to the intermediate strut. I will quote now from a letter dated May 16 from Mr. G. H. Mueller, chief engineer of the Curtiss Aeroplane & Motor Corporation, addressed to Mr. J. Hoffman—

Senator THOMAS. Who is Hoffman?

Mr. DEPEW. Hoffman was in the drafting room, in charge of the Bristol drawings, I think.

Senator THOMAS. For the Government or the Curtiss Co.?

Mr. DEPEW. For the Curtiss Co. Copies of this letter were sent to Lieut. Col. Hall, Maj. Moore, Mr. De Saules, Mr. Mesner, Mr. Webster, and Mr. Rohlf. This is a quotation from a portion of the letter:

Also issue instructions to the shop to alter the wing construction at the first two bays out from the engine section on the upper panels of the Bristol, either by putting in additional ribs or possibly leaving the ribs as they are and using veneer on the underside of the wing, from the leading edge back to the rear beam, and veneer on the top side from the leading edge to the front beam. Decision on either one of the methods of reinforcing the wing at this point will be reached later. On account of our not having on hand a supply of veneer of the proper thickness, it may be necessary to resort to additional ribs at those two sections of the upper panels and later utilize the veneer, when a stock is at hand, eliminating then the temporary additional ribs.

These changes are not to be made on the first 25 sets of panels to be shipped with the first 25 machines. However, such machines of the first 25 as are shipped without the altered wings should be accompanied by the additional material necessary to changing the wings over at their destination. If it is impossible to have this extra material accompany the panels, it may be sent later, but the feature of prompt shipment must not be overlooked.

Instructions should be sent to the shop at once, regarding the use of nothing but wax thread for sewing the linen to the wings. Investigation discloses that apparently the thread so used is not treated in any way.

Lieut. Col. Hall also requests that we should make preparations to steam bend the cap strips for the ribs of the Bristols, as instructions are due to come through from the Signal Corps to this effect. This is being done to relieve tension on all holding-down brads or screws.

All these items should be put into production at the earliest time possible, and definite arrangements should be made with the production and sales departments to have our sales orders amended accordingly.

For your information, the extra ribs for the veneer are being put in the upper panels to take care of the excessive pressure produced by the heavy blast from the Liberty motor, which blast starts the linen vibrating, causing the chafing of the linen on the cross members of the wings. In a short time this oft-repeated chafing and whipping destroys the strength of the linen. By spacing the ribs closer or covering the first two rib bays within the propeller zone, as above, the possibility of a flapping of the linen will be lessened and therefore the deterioration of the linen minimized.

That is all that refers to this point.

Senator THOMAS. Let me ask you about the 25 machines in which those changes were not to be made but which were to be shipped with the materials to make them. Did you have any talk with Mr. Mueller upon that subject?

Mr. DEPEW. Our understanding was that these were directions received from Col. Hall, and that those machines were to be shipped to Dayton and that therefore we had nothing to do with them as we were not to test them at Buffalo.

Senator THOMAS. You do not know whether they were shipped without the changes, or whether they were shipped at all?

Mr. DEPEW. One point I want to bring out is that this letter referred merely to the upper panels, whereas I called Mr. Mueller's attention to the fact that ours had pulled loose on the lower panels as well. He gave consent to have our machine fixed as we wished, but said

he would have to take it up with Col. Hall in regard to the production machines.

On the machine in which Rader was killed, the engine section panels were fixed the same as on our machine. The wings were different, having only two extra ribs, as called for in Mr. Mueller's letter quoted before, and having no veneer used on the wings.

Senator THOMAS. Is the use of veneer to substitute for additional braces or ribs in the wings?

Mr. DEPEW. The veneer is used to stiffen the nose of the wing, as ordinarily used.

Senator THOMAS. State what veneer is, for the sake of the record.

Mr. DEPEW. Veneer is wood sheeting made up of two or more laminations of wood glued together.

Senator THOMAS. The addition of more laminations strengthens the material to which it is added, does it?

Mr. DEPEW. It is not used in that way. The veneer is applied to the wings to stiffen the structure, and sometimes to hold the proper curvature of the cloth.

Senator THOMAS. Do you know what the horsepower of the engine used by the British in the Bristol plane is?

Mr. DEPEW. I was informed by Capt. A. B. Rodgers, an Englishman, that they had never used a motor of over 275 horsepower.

Senator THOMAS. What is the style of the motor?

Mr. DEPEW. Rolls-Royce.

Senator THOMAS. And the weight of the motor?

Mr. DEPEW. I do not know the weight exactly. I believe about 200 pounds lighter than the Liberty. I am not sure of that.

Senator THOMAS. What is the weight of the Liberty motor?

Mr. DEPEW. About 824 pounds.

Senator THOMAS. And the horsepower?

Mr. DEPEW. About 400. They vary somewhat.

Senator THOMAS. Now, what effect upon the structure of the Bristol machine would the added horsepower, if utilized, have particularly within the propeller zone?

Mr. DEPEW. The added horsepower would set up increased stresses in various parts of the machine. These stresses might cut down the factor of safety to a dangerous degree. Aeroplanes are delicate mechanisms, very carefully designed, and changes of as great importance as this can be made only with very great care.

Senator THOMAS. Do you think that the added weight of the Liberty motor, and the result upon the frame of the plane—the structure of the plane—by the increased power, had anything to do with the accident to Mr. Rader?

Mr. DEPEW. Well, I do not know exactly why the linen ripped. It may possibly have been the quality of the linen. It may be that with a motor of lower horsepower it would not have happened.

Senator THOMAS. Those are matters of speculation?

Mr. DEPEW. Yes, sir.

Senator THOMAS. Did you have any talk with Mr. Mueller or any other officers of the Curtiss Co. regarding that tragedy after it occurred, before you left there?

Mr. DEPEW. Yes, sir.

Senator THOMAS. With whom?

Mr. DEPEW. With Mr. Mueller.

Senator THOMAS. Please state it, as nearly as you can remember.

Mr. DEPEW. Mr. Mueller was explaining to Mr. Rohlf's that in increasing the thread count of the linen used on the Bristol planes, the Signal Corps had secured increased strength, but that it had been found that the resistance to ripping was greatly reduced. I repeated, during this conversation, that I did not consider that the Bristol machine would stand the strain of the high-powered Liberty motor, which opinion I had expressed before. The statement was made by Mr. Rohlf's that if he and I had been left in charge of the flying field, as we were at first, there was a great probability that this accident would not have happened, as, having called attention to similar trouble with the machine before, we would have watched this matter very closely. Mr. Mueller stated that the cloth should be laid with the threads running diagonally and not running straight, as was the practice at that time. This would cause both the warp and the woof to take up the stresses, and not merely the threads running in one direction.

It might be stated that the management of the flying field was taken away from Mr. Rohlf's several weeks ago, and the Signal Corps put in charge of the work.

Senator FRELINGHUYSEN. Was there any opposition by Mr. Mueller to your suggestions for improvement of the Bristol fighter?

Mr. DEPEW. Yes, sir.

Senator FRELINGHUYSEN. That you made from time to time?

Mr. DEPEW. Yes, sir.

Senator FRELINGHUYSEN. What were they?

Mr. DEPEW. The tendency was to take suggestions only from Dayton, and to give very little consideration to the suggestions from the Curtiss test pilots. This was the main reason that I resigned from the company. I have a copy of my resignation.

Senator FRELINGHUYSEN. Did Mr. Rohlf's agree with you in regard to the recommendations which you made from time to time?

Mr. DEPEW. He did.

Senator FRELINGHUYSEN. You made them jointly?

Mr. DEPEW. Usually; and sometimes independently.

Senator FRELINGHUYSEN. But you both agreed as to the nature of the recommendations?

Mr. DEPEW. We both agreed on almost every item.

Senator FRELINGHUYSEN. Is Mr. Rohlf's still with the Curtiss Co.?

Mr. DEPEW. I do not know whether he is with the corporation. He was on the point of resigning when I left and of going with the Curtiss Engineering Corporation at Garden City. Whether he has done so, I do not know.

Senator FRELINGHUYSEN. Are there any other structural weaknesses, in your opinion, in the Bristol fighter?

Mr. DEPEW. Personally, I do not like the attachment of the wings by means of plates to the bolts, running down through the beams.

Senator FRELINGHUYSEN. Are there any others?

Mr. DEPEW. I do not like the machine as a whole. That covers it broadly. As I view it, I do not think it will stand the motor. When I first saw an English Bristol in the drafting room last fall, without any motor in it, I did not like the machine, nor did Mr. Rohlf's. Mr. Mueller stated to both of us on June 17, 1918, that he did not like it, either.

Senator FRELINGHUYSEN. Mr. Mueller stated that?

Mr. DEPEW. Yes, sir. Upon more than one occasion he has expressed the fact that he did not like the Bristol machine.

Senator FRELINGHUYSEN. Do you know who forced the Liberty motor into the Bristol machine—on whose recommendations it was put in?

Mr. DEPEW. I do not know, but I think the Bristol machine is entirely in charge of the Signal Corps; that the Curtiss Co. has very little to say as to what shall be done; that they take their orders from the Government.

Senator FRELINGHUYSEN. During your employment by the Curtiss Co. have you differed on other points with Mr. Mueller?

Mr. DEPEW. Most of the points of difference have been on the Bristol machine, inasmuch as that was the main work to be done in the field. However, one very important matter, where there has been a great deal of difference, is on the new machine known as the Curtiss-Bristol.

Senator FRELINGHUYSEN. There have been statements made that Mr. Mueller is, by reason of his German ancestry, of pro-German sympathies. Do you believe that?

Mr. DEPEW. No, sir. I have heard these rumors, but never found anything that led me to believe it, personally.

Senator FRELINGHUYSEN. Do you believe that Mr. Mueller is anxious or is more interested in the commercial success than in his profession as an engineer, to perfect construction?

Mr. DEPEW. I think the influence has been that powers above him have come down on him to produce results. I might add here, the tendency is toward production at any cost.

Senator FRELINGHUYSEN. And not perfection?

Mr. DEPEW. And not perfection. They must produce, no matter how poor the product is. Anything that holds up production is hardly tolerated. The mistake is made of starting production in quantity on new machines or parts before the machine has been thoroughly and successfully worked out.

Senator FRELINGHUYSEN. Did the additional radiators on the side of the fuselage increase the weight of the machine?

Mr. DEPEW. It would be necessary to have radiators somewhere, and they would not weigh any more there than in other positions. Changing the location of the radiators changes the balance of the machine.

Senator FRELINGHUYSEN. Those were additional radiators, were they not, in addition to those on the machine?

Mr. DEPEW. No; there were no radiators on the engine. The radiators have been tried on the side of the fuselage; also in the engine section panel, which has not yet been a success, and experiments were later being made, locating the radiators above the engine section panel, although this had not been tried in the air at the time of my leaving.

Senator FRELINGHUYSEN. Do you know of any other accidents of a similar character to any other machines made by the Curtiss Co., developing this structural weakness in the wings?

Mr. DEPEW. I have never known of any accidents where the fabric ripped that way with the exception of once at Dayton, and the accident noted above, when Mr. Rohlfs and I were in the machine,

ready to go, when the fabric was found to have pulled loose from the ribs. After Rader's accident, certain men from the Curtiss Co. came to the flying field and the motor in the other Bristol machine that was to go to Dayton, a machine similar to Rader's, was run on the ground, with the result that the cloth was seen to vibrate on the wings, and, upon examination, was found to be loose in places, the same as on the other machines. This machine had been flown probably half a dozen times, for a total of, I would think, not more than two hours, if that.

Senator FRELINGHUYSEN. What is the Curtiss-Bristol machine?

Mr. DEPEW. The Curtiss-Bristol machine is a new two-place fighting machine being built at Buffalo. I am unable to find out exactly who was responsible for this machine, but my understanding is that it has been worked out jointly by the Signal Corps and the Curtiss Co.; that is, by Col. Hall and Mr. Mueller.

Senator FRELINGHUYSEN. Has that machine been flown?

Mr. DEPEW. It had not up to the time of my leaving, and I think it has not been up to the present time.

Senator FRELINGHUYSEN. How does it differ from the Bristol fighter?

Mr. DEPEW. It does not resemble the Bristol at all.

Senator FRELINGHUYSEN. Is it a larger machine?

Mr. DEPEW. I do not know the exact dimensions, but it is about the same size.

Senator FRELINGHUYSEN. Is it a better machine for the Liberty motor?

Mr. DEPEW. I consider that the machine, in its present form, is useless for fighting.

Senator FRELINGHUYSEN. Why?

Mr. DEPEW. Owing to the very restricted vision. It is practically impossible to see, when landing this machine, and when the machine is in a climbing position, the view ahead and downward is almost entirely cut off. I made the statement, when asked by Mr. Mueller what I thought of this machine, that the vision was exceedingly poor and that I considered that an enemy machine could very easily attack this machine from the front and below. He differed from my ideas, and stated that this machine could not be attacked as it was so fast that it would do the attacking. I made the remark that in attacking a machine an enemy always endeavored to attack from the blind spot. The small celluloid windows in the side of the fuselage, intended to give the pilot some vision ahead, were practically useless. The attachment of the wings to the fuselage cuts off the view. In a later conversation with Mr. Mueller the subject was gone into further and he remarked that, inasmuch as I had never fought in an aeroplane, I was not competent to judge.

Mr. Rohlf and I later talked with Lieut. Flachaire, of the French Army, a noted "ace," and he confirmed our opinions of this machine. He stated that he had told Mr. Mueller that it could not be successfully used, as at present, and that the upper wing must be raised to give the pilot better vision. He stated that he would not fly it in its present condition and advised Rohlf not to, and said that it would be useless to fly it as at present, in any case, because it would positively have to be changed before being of any value as a fighter.

Senator FRELINGHUYSEN. That is all I have to ask.

Senator NEW. I would like to ask just one question. Have you had any experience with the "De Haviland 4" machine?

Mr. DEPEW. I have not. I have seen the machine and seen it fly, and that is all. If I may put in one summing up, one of the chief difficulties of the situation is the fact that there are men holding responsible positions who do not know enough about aeroplanes. The tendency is to refuse advice from those who have had flying experience.

Another great difficulty is careless workmanship, this being especially marked in the first Curtiss-Bristol, which is a terrible example of workmanship, in some respects. Careless inspection is also very often found when the pilots look over the machines themselves.

I wish to state here that none of my remarks apply to any members of the Curtiss Engineering Corporation at Garden City, Long Island, but merely to the Buffalo plant.

Senator THOMAS. The Elmwood plant?

Mr. DEPEW. The North Elmwood plant; yes, sir.

Senator NEW. Just one further question that may have been asked you while I was not here. Do you believe the Liberty motor is adapted for use in any of the single-seater machines?

Mr. DEPEW. Absolutely not.

Senator NEW. Or any of the two-seater machines?

Mr. DEPEW. Yes, I believe it can be used in the two-seater machines, but not in the single-seater fighters. It is too large and powerful for the single-seater machines. It is adapted to the heavier machines and bombing machines, and to some of the two-seater fighters.

Senator NEW. But limited to certain kinds of two-seater fighters?

Mr. DEPEW. Limited in this sense, that the machine must be designed for the motor.

Senator NEW. That is exactly the point I want to make. Do you not think that the machine should be designed for the motor?

Mr. DEPEW. Why, certainly it should.

Senator NEW. And that it is a mistake to try to put the Liberty motor in a machine that has been designed for a motor of another and lighter character?

Mr. DEPEW. I think if there is a great difference in the weight and power of the motors, that it is a mistake. I think that it might be possible to adapt a machine for the Liberty motor if the motor for which it was designed was not too different from it; but you can not do what they did, according to Capt. Rodgers. He said they did not design this machine for the Liberty motor, but simply stuck it in there, and that expresses it. An aeroplane has to be carefully worked out and all parts coordinated. It is a very delicate mechanism, and some of them have overlooked that. They have not been making aeroplanes long enough. Some of them had been building lifts, and so forth, up to a year or so ago. They are probably excellent production men, but not of aeroplanes.

STATEMENT OF JOHN H. DAVIS.

Senator NEW. What is your present occupation, Mr. Davis?

Mr. DAVIS. I do not suppose I have any, just now. Efficiency engineer is my profession.

Senator NEW. Are you a flyer?

Mr. DAVIS. Yes, sir.

Senator NEW. Where and when did you learn to fly?

Mr. DAVIS. I learned to fly at Hempstead, in 1910.

Senator NEW. Do you hold a pilot's license?

Mr. DAVIS. Yes, sir.

Senator NEW. To what extent have you flown?

Mr. DAVIS. Do you mean for the Government or——

Senator NEW. For the Government or in your private work.

Mr. DAVIS. In private, I had my own machine and just flew for the sport. I learned to fly in one of the old Curtiss pusher types. I did not have an instructor. I learned by myself and I have flown after office hours just for the fun of it. I never did any exhibition flying or professional flying.

Senator NEW. Have you, at any time, been in the employ of the United States Government?

Mr. DAVIS. Yes, sir.

Senator NEW. As an aviator?

Mr. DAVIS. Yes, sir.

Senator NEW. In what capacity and where?

Mr. DAVIS. Civilian instructor at Kelly field, San Antonio, Tex., and Gerstner field, Lake Charles, La., 17 miles outside of Lake Charles.

Senator NEW. Mr. Davis, you are an efficiency expert, I believe, by profession?

Mr. DAVIS. Well, I would not say expert, but engineer.

Senator NEW. Efficiency engineer by profession?

Mr. DAVIS. Yes, sir.

Senator NEW. You have been at those fields in an official capacity for some time—several months, I believe.

Mr. DAVIS. Yes, sir.

Senator NEW. I wish you would, in your own way, state to this committee if you have observed anything that you think is wrong; if so, what it is, and just, in your own way, tell, now, some of the suggestions that you have to make for improvements in the conduct of those fields.

Mr. DAVIS. I was employed at Kelly Field, San Antonio, Tex., as a civilian instructor, but having to fly only one half of each day I offered my services for the other half of each day as an efficiency engineer. I was provided with credentials that gave me free access to all office and shop records and permitted obtaining such other information as I might by asking questions in the various departments.

The men talked freely with me because I was a civilian. I found a lack of proper spirit among them, due, first, to their failure to obtain the necessary tools with which to keep the planes in good order; second, they received no encouragement for the work they did, though their hours were long and their accomplishments remarkable, considering what they had to work with; third, many of them had entered the service with the distinct understanding that they were to be made aviators; otherwise they would not have entered until drafted.

I encouraged the men to talk to me as freely as they would like to talk to the commanding officer were they permitted. I gave them to understand that every just complaint that I could verify would be

reported direct to the commanding officer without disclosing the source of my information. I likewise warned them that they would be reported for any complaints made that had no foundation in fact, and it is needless to say they gave me the facts.

I found incompetent, inefficient officers between the men who were doing the work and the only man who could get them the necessary tools, material, and spare parts with which to do the work. This man was Col. Chitty, the commanding officer. I traced the various requests of the men for tools, spare parts, etc., through all the hands each request had to pass, each man confidentially shifting the blame to some one higher up than himself because the knowledge of each officer of any requisition extended only to the next man above him. I found important requisitions that had been lost in the files for six months on the way to the commanding officer from the men who originally made the requests. Consequently there were no drop-lights in any of the hangars, work being done at night with pocket flash-lights. There were only two spark-plug wrenches in the entire 24 hangars. Plugs had to be put in with pliers or some other makeshift arrangement that ruined many plugs to say nothing of the waste of valuable time and the discouragement of the men. The few tools that were in the hangars appeared to be of no better quality than those purchased at a 10-cent store. There was no steam box in which to bend longerons, so they had to be forced into shape from straight material and often four or five were broken before one could be found that would stand the strain of being forced into place. The fuselage had to be trued up on a wooden table that warped out of shape with every change of the weather and had to be lined up anew for each job, and this was done by putting chips of wood under the legs. Planes with these longerons forced into place would warp out of line when in the air due to the addition of flying strain, but would warp back into line when on the ground, so though they would not fly true nor stunt properly the E. and R. would check them up on the ground and find them O. K.

For lack of glue presses, which had been ordered for months, for gluing up propeller forms, 300 propellers had to be ordered, at \$75 apiece, though with the presses, propellers could have been turned out complete for less than it was costing to have the forms glued up in San Antonio. The forms cost \$25 each and three days' labor was required to finish the propellers at the field. Motors were allowed to run without overhauling until they broke down, though overhauling at the proper time would have added from 50 to 100 hours to their serviceability. Wrecks had to be stripped for spare parts and cables, because of a shortage of everything necessary to keep planes in commission. The men in the shops did not even have blue prints to work from; they had to be furnished with a sample of the part to be duplicated and had to take all their measurements from the part, causing not only a great waste of time but many mistakes. There did not seem to be any time-saving methods in use. The men even had to take their own measurements when supplying cable lengths because incorrect lengths were given on assembly diagrams furnished by the Curtiss Co. Much of the cable at Kelly Field was so highly tempered that it frayed badly, and, though O. K'd by the testers, I considered it dangerous and repeatedly advised against its use; but they had to use it, and also cable of smaller and larger size than

specifications called for, in order to keep planes in commission as long as possible while waiting for cable that had been ordered for months. I do not know of an instance where a frayed cable broke and caused an accident, but I think it quite likely that a few accidents may have been caused by the frayed cable, causing controls to jam.

I had a long talk with the commanding officer, Col. Chitty, about conditions at the field in general, and the incompetency of some of the officers in particular, including the executive officer at Kelly Field No. 2, Maj. Ferron. Col. Chitty said the fault was in Washington. He claimed that Washington was trying to run things down there instead of leaving it to him. He said that Maj. Ferron was ordered down there by Washington, but had not been placed under the jurisdiction of the commanding officer. The colonel said that he would not have the major in his office at \$10 per week, but did not have the authority to discharge him. Colonel said the same thing about the engineer officer, and asked me as an efficiency man if I thought that was fair. I agreed with the colonel that it was not good business and told him that if I was commanding officer of the field I would not stand for it, but would demand of Gen. Squier that I be given full authority as commanding officer or be relieved. The colonel did not seem to consider the suggestion practical, so I told him that if he did not do something to straighten out the situation, which I considered serious, I would phone Gen. Squier and explain the whole situation. The colonel said he would be glad if I could get something accomplished.

The number of planes in commission had fallen off so rapidly on account of spare parts that I was told by the officer in charge of flying that unless something was done quick there would not be a single plane in commission at the field within 15 days. I went to Col. Chitty with this information, which did not surprise him, but he said he could do nothing that he had not already done; so I went back to the hotel and phoned Gen. Squier's office. Gen. Squier being out of the city, I talked to Gen. Saltzman. I explained the situation, which he could hardly believe, but I told him that he did not have time to investigate, but would have to act first and investigate later, if the situation was to be relieved.

I also suggested that he summon Maj. Burwell, the officer in charge of flying, to Washington for a conference regarding conditions at the field. Gen. Saltzman referred me to Gen. Ruckman, in command at Fort Sam Houston. I was surprised at being referred to Gen. Ruckman until I met him and learned that he had known Gen. Squier intimately for 25 years. I discussed the entire situation in detail with Gen. Ruckman, and he made an investigation on his own account and found it necessary to recommend to Gen. Squier that Col. Chitty be relieved as Commanding Officer of Kelly Field. Col. Chitty was relieved. Gen. Saltzman had spare parts—tools and motors on the way to Kelly Field by express within a few days, and in less than a month, I should say, they had over 100 planes in commission. If I remember correctly, there were less than 30 planes in commission when the spare parts began to arrive. This was in February.

REGARDING ACCIDENTS.

There will always be accidents, due to carelessness or recklessness, but none of them need be fatal, and all accidents, except those due to carelessness or recklessness, can be entirely eliminated. There is no doubt in my mind that many fatal accidents resulting from tail spins too close to the ground, have been due to lack of a guard over bolthead or nut in fitting where elevator cable attaches to arm at rear of rear seat in some stick-controlled planes. At a certain position of stick, this bolthead or nut (depending from which side the bolt is entered) very easily catches in the anchor wire of the safety belt, and locks the control in the stall position. I have no hesitancy in charging gross negligence on the part of somebody at the Curtiss factory. The same kind of negligence in construction of some Dep-control planes has been the cause of accidents from spinning nose dives, in my opinion. On some of the Dep planes, the thin mahogany instrument board in front compartment is entirely without bracing, and if wheel is pushed too far forward, instrument board gives enough to permit cable pulley to pass beneath, then board springs back in place and controls are rigidly locked in forward position.

I recommended to the engineering department of Kelly Field that metal guards be placed over those cable connections, which would entirely eliminate the trouble on the stick-controlled planes. The E. and R. agreed with me, but while I was there nothing was done to put the suggestion into practice. They did, however, at my suggestion brace the instrument board on the Dep-controlled machines. I also recommended that both matters be taken up with the Curtiss Co. Whether or not that was ever done I am not able to say. All fatal accidents that I have witnessed have been due to the collapse of the fuselage between the front seat and the motor. A very simple method of bracing would make it impossible for the seat to get any nearer to motor even though the plane fell 500 feet, so the instructor would not be crushed against the motor, as now invariably happens. The engineering department at Kelly Field agreed with me on this point also, but while I was there nothing was done to put the suggestion into practice.

Since early in January of this year I have continually urged the development and adoption of some method of communication between the instructor and student while in flight. Not only would the time of training be considerably shortened, but accidents due to students getting scared and freezing onto the controls would be eliminated.

RECOMMENDATIONS.

Commanding officers of flying schools should be chosen for their business experience and executive ability.

A commanding officer qualified to command in the fullest sense of the word should be given full authority to use his own judgment in all matters pertaining to the management of his field that do not directly oppose the general policy as laid down by the Director of Military Aeronautics. A commanding officer should feel free at any time to make any suggestion that he may deem advisable to the Director of Military Aeronautics, even though such suggestions might be for changes in the general policy. Strict military rules and

regulations should not be enforced at the expense of sound business principles and efficiency at flying schools. A strictly military organization is as great a hindrance to a flying school as it is a necessity in some other branches of the service.

The indiscriminate transfer of men from one field to another, without considering the effect of such transfer at the particular time on the department to which the man is connected, interferes seriously with the efficiency of the organization.

The chief officers of all departments, including the commanding officer, should have in training an assistant to fill the place of his immediate chief, so that either might be transferred at any time without affecting the program of that particular department.

Fields should not be chosen without considering the effect of climatic and other conditions on the type of motors to be used in the particular branch of the training division intended to occupy the field.

Experimenting for the improvement of field, or for in any other way improving the service, should be encouraged at all fields.

A lack of cooperation between the various departments of the field is due to the absence of a business system that makes it possible for the commanding officer to know at all times the exact condition of each department and the relative efficiency of all. A regular set of books should be kept at all schools, with time, labor, and material reckoned in dollars and cents. There is no good reason why just as much care should not be exercised in looking after Government business as would be required of private enterprises.

Exceptional meritorious services of individuals at the field should be recognized; approved, and rewarded in order to stimulate the work of others and create generally a better spirit among the men, resulting in a better cooperation and higher efficiency.

An efficiency engineer should be stationed at each school to act in an advisory capacity to all departments. It would be his duty to discover every phase of the business that was wasting either time or money and work out the proper solution in conjunction with the department affected. The efficiency engineers should be civilians.

When I offered my services to the Government as a civilian instructor, I did not expect to do anything but fly; that is, I did not expect to do anything in an engineering capacity at all, but when I arrived at Kelly Field and was tried out and accepted, I had only to fly a half day. The instructors are not required to fly all day long. I offered my services, therefore, to the commander of the field as an efficiency engineer. I said that that was my profession, and I would just as soon work all day as half a day. Maj. Burwell, the officer in charge of flying, said that if there was anything they did need it was an efficiency man, and he gave me the proper credentials—that is, the executive officer and engineer officer gave them to me—which enabled me to call for all the records and have free access to the shops and get any information I wanted.

That was brought about chiefly by some planes that were tried out and found to be wrong and sent back to the E. & R., and they were checked up to be perfect and sent back up into the air with testers and found to be out of line; that is, they would spin in one direction and would not spin in the other, or you might get them to spin in one direction, the direction in which they were going, and you could

hardly get them out, and there were several narrow escapes from that. Finally, the E. & R. claimed that was due to the fact that three fuselages, when being unloaded from the cars, had been dropped, and though they checked them up and found nothing wrong, those must have been the ones that turned out wrong. They did not make any report on them because they did not appear to be injured at the time they were unloaded.

The way I started in, I went right to the bottom of it, where they repaired the machines, and showed my credentials to the sergeant in charge and told him I was a flying instructor, but also an efficiency engineer, and that I had been sent to see if I could help him out and for him to tell me his troubles. He said: "If you are an efficiency engineer all you have to do is to look around and see what the trouble is." I looked around, and one of the first things I noticed was that they were bending a longeron in the upper right-hand corner of the machine cold; that is, they took just the straight piece and fastened it to the tail and took weight enough to force it into place or into the proper shape. I was very much surprised to find them doing that kind of work. I said: "You do not mean to tell me you put on longerons in that way?" They said that they could not do it any better. I said: "Do you not know the other longerons are steamed and bent?" and they said, "Yes;" that they had broken four or five of them before they could get one of them placed into position. I said: "Why have you not a steam box?" This man said: "I have asked for a steam box until I am disgusted; I have bent up some old pipe as a makeshift, and have bent some of these longerons and put them in." I asked this mechanic about the three planes that had had the trouble in the air and he said that he had heard about them. I said: "Do you not know that to put this strain on one corner, even though you can brace the struts, etc., that when you get the machine up in the air and you encounter the extra air pressure, it will throw it out of line; that although it will check up all right on the ground, when the extra air pressure is applied it will get out of line, and after the air pressure is released, it will return to the original position, making it absolutely impossible to check up while on the ground?"

Senator THOMAS. Have you given us the date of this happening?

Mr. DAVIS. That was some time in January.

Senator THOMAS. Of this year?

Mr. DAVIS. Yes, sir; so I said to him, "To whom did you mention this steam box," and he said, "To the M. E. E." I said, "What is he supposed to do?" He said that he was to take it up with Lieut. Davis in charge of that part of the repair shop. I said, "All right, I will look into it." Then I noticed the table on which these fuselages were lined up, and I noticed that it was a wooden table with a lot of chips under the legs. Now, these tables must be absolutely level to line a fuselage up properly. The Curtiss Co., for instance, has a steel table with the exact form and shape of the longeron. That is so it can not warp out of shape. When they clamp a piece there, they know it is absolutely right, but with this wooden table it has to be lined up every time they start to put on a new fuselage or make any repairs at all. He said they had gone through the same arrangement, or the same press, rather. I asked him why he did not go to the officer in charge of flying and he said he could not do it; that there was only

one man he could report to. I said, "You seem to be perfectly free with this information to me." He said, "Well, you are a civilian. We are mighty glad to get a chance to talk with a civilian, because we can talk to you as we want to." This was a pretty bright chap, a college graduate, and he told me he had been promised when he enlisted that he would be made a flier.

Senator THOMAS. What was his name?

Mr. DAVIS. I have it, but not with me. So, he was promised if he enlisted in the Aviation Section, he would be made a flier; otherwise he said he would have waited until he was drafted. He was put in as a mechanic and he saw no chances for promotion. He wanted to get on the other side as a fighting flier, but he could not get ahead with it.

I went to the man this man was supposed to report to, and the man that he, in turn, was supposed to report to, and all the way up, and found requisitions had been made for tools, drop lights, etc., that had been lost for six months and that had never gotten to the commander's office. I dug these requisitions out of the files. I went to each one of them. I never told the first fellow—I said to the first man, "Anything you tell me is confidential, provided I can verify any complaint you make." I said, "I want you to tell me just what you would like to tell the commanding officer, if you were in a position to speak to him, and I will guarantee it will get to him if I can verify it." For instance, it would not do for me to go to the commanding officer and say, "This man complains of his superior officer," without being able to verify it. The man talking to me knew that if I could not verify this, and find that this man at the head was lax in his duty, it would mean his head was to come off, because I was to use his name in that event. I was perfectly free to tell anyone his name if I could not verify his statements.

I went all the way through with this, taking it finally to the commanding officer himself.

Before I get to that, I would like to say that in the propeller department, for instance, they were paying \$25 to have these forms glued up under presses, and they would send them to the field and they would work three days shaving them down by hand. They could not build those propellers fast enough that way, so they gave an order for 300 propellers at \$75 apiece, when a few hundred dollars spent for a glue press and a few instruments to work with would have enabled them to turn out the complete propellers for less than they were getting these forms built for.

I took this up with an inspector who was down there at the time, and also this other matter.

When I asked these mechanics—these men who pointed these things out to me—why the inspector who had been down there a few days before did not find those things out, they said, "We can not give him any information; we can only answer questions." I asked Lieut. Davis and the master electrician the same thing, and they told me that before an inspection is made by an inspector there from Washington, the tip goes out that an inspection is to be made at 2 or 3 o'clock and everybody cleans up and everything is in apple-pie order when the inspector comes down. He goes around with the commanding officer and sees everybody working in the shops, and everything in apple-pie order, and is satisfied. The mechanic

who is doing the work and the man who has the information can not open his mouth on those occasions.

Of course I took all this up first with the officer in charge of flying, Maj. Burrell. I made certain suggestions about what should be done, and he approved them, but he did not have the authority to put them into effect. For instance, the flying department, so far as the actual hours in the air were concerned, for which he was responsible, was very highly efficient, but he had no jurisdiction over that department that affected the efficiency of his department, and so his hands were tied. I wanted him to take it up with Col. Chiddy, but he said the only way he could take it up was through the executive officer at No. 2, who, at that time, was Maj. Ferren. I could not get any satisfaction out of Maj. Ferren because he was not the executive officer, officially. He was a good flier. I saw Col. Chiddy, and he passed the buck up to Washington. He said the fault was not there, but in Washington. He said, "They can not expect to run this field from headquarters; it can not be done." He said, "I am in charge of the field, and they send an executive officer to field No. 2, and I can not fire him or anything of that kind." He said, "As an efficiency man, would you say that that was fair?" I said, "Certainly not." He said, "What would you do?" I said, "I would either be commander with all the authority of a commander, or they could put someone in my place." He said, "I would not have that man in my office at \$10 a week, but I can not discharge him." He said the same thing about the engineer officer. I told him that if he did not take it up with Washington, that I had met Gen. Squier a few years before and that I knew Gen. Saulsman even better than Gen. Squier, and I said, "Colonel, this is not my business, really, but I feel the situation is serious and something has to be done with it, and if you do not care to take it up with Gen. Squier, I will call him up by phone myself, if necessary."

So, I finally did call him up.

Senator THOMAS. From down there?

Mr. DAVIS. Yes, sir; from San Antonio; but before I did that I stumbled onto a more serious proposition, or a situation, and that was the fact they were taking these wrecks and taking parts out of the wings, etc., to repair other machines. If they did not have a cable of the proper size they would use the next thing to it, out of these wrecks, and put it in. So, I got after that and asked them what authority they had to do that—these mechanics—and they said, "That is all we had to use; we had so much time to get it out in, and that is all we had." They told me that they did not make any written reports or recommendations covering these matters; that they would verbally report that, say, three-eighths or five-sixteenths—oversize or undersize—was plenty strong, strong enough to come within the factor of safety. They would get some cable there that was of such high temper it would fray very easily. You could go over a cable with your hand and find little wires sticking out all over. The testers approved that, and I called their attention to that. The testers claimed they had put the cable under a strain and found it was perfectly safe, and that apparently the only strands broken were on the outer surface. They did not know there were probably just about as many strands broken on the inside as on the outside. The instructors were afraid of them. Many times there would be so

many strands frayed they would turn them back. Of course it is absolutely impossible to prove any of those wrecks were caused by that, but it would be possible for those cables to get in such condition that they would break, and go through and jam the controls; but you can examine a wreck all you want to and you will never find that out.

Senator NEW. In private conversation with me you spoke of a control lever.

Mr. DAVIS. Yes, sir; I was just going to speak of that.

Senator NEW. A defect in that which might very easily lead to a fatal accident.

Mr. DAVIS. I am satisfied a number of accidents have been due to the fact that the elevator cable connection—that is, the cable that goes up from the elevator just back of the seat on a stick-control machine has a connection with an arm just back of the rear seat. Now, at a certain position of that stick, either at this position [indicating], where you push it forward to go down or back to go up—in that direction [indicating] it is forward and in this direction it throws it this way [indicating]. If you pull it halfway between—

Senator THOMAS. When you say “there” and “here” it means nothing in the record.

Mr. DAVIS. I beg your pardon; I will illustrate that. Now, here is the stick. If you lean it in that direction—in the right direction—it causes it to lean in this direction, and this way [indicating] backward, it makes the ship climb. If you pull it this way it will climb.

Senator NEW. That is back, and to the left?

Mr. DAVIS. Yes; back and to the left or back and to the right to go into a tail spin. In either one of those positions this cable connection back here [indicating] gets caught sometimes in the anchor wire of the safety belt. If the operator wants to make a quick turn close to the ground, which is just as safe as at a high altitude, if he should throw it into that position [indicating] and could not get it back immediately, he would be in a tail spin so close to the ground he could not get back at all. If he could shift hands and disconnect it—it does not jam, or anything like that—but when you get into a situation like that, and most of them do not know anything about that, it would be a control jam, and they would be killed.

Senator NEW. I have noticed in a number of published reports of fatalities at those southern fields accidents just such as you have described as likely to happen from that sort of defect, which permits your control to get caught in that chain—

Mr. DAVIS. Absolutely.

Senator NEW. I have noticed a number of reports of accidents which can, in my judgment, be attributed to that very thing—fatal accidents.

Mr. DAVIS. I believe every one of those, where there was an instructor in the machine, where they got into a tail spin near the ground is due to that. An instructor is not going to get into a tail spin that close to the ground.

Senator NEW. Was any effort made to correct that defect to insure against the possibility of that kind of an accident, if you know?

Mr. DAVIS. No, sir; there was not.

Senator NEW. Did you make any recommendation?

Mr. DAVIS. I certainly did.

Senator NEW. Did you make any recommendation to guarantee against the possibility of that kind of an accident?

Mr. DAVIS. I did.

Senator NEW. What was that?

Mr. DAVIS. I reported it first to the officer in charge of flying, and he told me to go to the engineering officer and tell him about it; and I did, but I said "Before I do that, I would advise that you send somebody to every stage in this field and point that out to the instructors and show them how that works and tell them to be on the lookout, because the instructor is not in the rear seat of the machine, but is in the front seat of the machine." The instructor must instruct every pupil he takes up. Just a metal clip over there would fix it so it would never happen.

Senator FRELINGHUYSEN. What machine was this?

Mr. DAVIS. Curtiss machine.

Senator FRELINGHUYSEN. Training machines?

Mr. DAVIS. Yes, sir.

Senator FRELINGHUYSEN. And you say nothing was done to make that correction in accordance with your suggestion?

Mr. DAVIS. Not while I was there, no, sir; although the engineers agreed with me.

The Major designated me to go around and give the instructors these directions and explain why this thing would happen and how to prevent it, and to tell them not to pull the lever in that direction until it could be remedied.

Senator FRELINGHUYSEN. You stated you telephoned to Washington. Why did you telephone?

Mr. DAVIS. I called for Gen. Squiers, but he was out of town, and I talked to Gen. Saulsman. I had to hurry that along quicker than I wanted to, because I had some other stuff to talk about and I told him that if they did not get some of that stuff they had been ordering for months and months down there, there would not be a single machine in 15 days, in spite of all the requisitions and orders that had gone through. I went to Col. Chiddy about that and he said he could not get spare parts. I said, "Do you know you will not have a single machine down here in 15 days if you do not get parts?" I told Gen. Saulsman that and he said he could hardly believe it.

Senator FRELINGHUYSEN. Did you get immediate action?

Mr. DAVIS. Yes, sir; by express. I never saw anything like that. Of course, in a few days they had 70 machines.

Senator FRELINGHUYSEN. Is that the only experience you have had with Gen. Saulsman as an executive officer?

Mr. DAVIS. I phoned him one other time when I had to get hold of him. I phoned and reported the situation there, and I said, "There is not the proper feeling among the men; the thing is all pulled up because you people have sent men down here without putting them under the command of the commanding officer of the field." I said, "You ought to have"—I said, "I want to advise you to have Maj. Burrell to come to Washington for a conference on his situation, because it is serious." He said, "You go and see Gen. Luckman," who was the commander of the Southeastern Department there at San Antonio—I think that is the department.

Senator THOMAS. It is the department which comprises Texas, but I think it is the Southwestern Department.

Mr. DAVIS. Yes; I think it is. After talking with him I found out he was intimately friendly with Gen. Squier and had been for 25 years. That is the reason I was referred to him—referred to somebody right on the job. They were not willing to take my word for it. As soon as I explained the situation he said that the commander of the field was responsible for that. I told him of my talk with the colonel and how he put the blame on Washington. Gen. Ruckman said he would investigate it, and he did do it, doing it himself, and then he sent his report to Washington. He told me he had, after his investigation, found it necessary to recommend to Gen. Squier that Col. Chiddy be relieved as commanding officer of Kelly field.

Senator NEW. Was he so relieved?

Mr. DAVIS. Yes, sir; he was ordered here first—so I saw in the report in the papers there—to be promoted to brigadier general and put in charge of the Southeastern Department, at Charleston.

Senator NEW. What time was that, approximately?

Mr. DAVIS. I should say this was in the early part of February, as near as I can remember.

Senator FRELINGHUYSEN. How long were you at Kelly field?

Mr. DAVIS. I arrived at Kelly field in the latter part of November. I should say.

Senator NEW. How long were you there?

Mr. DAVIS. I left there on the 21st of February.

Senator FRELINGHUYSEN. How many accidents occurred during your service there as an instructor?

Mr. DAVIS. I could not say offhand. I should say four or five.

Senator FRELINGHUYSEN. How many were due to this defect?

Mr. DAVIS. This particular defect here?

Senator FRELINGHUYSEN. Yes.

Mr. DAVIS. If I could see the record of the accidents and could see who were in them, I could remember, but I can not recall now.

Senator FRELINGHUYSEN. Were all these men killed?

Mr. DAVIS. Not all of them.

Senator FRELINGHUYSEN. How many?

Mr. DAVIS. Well, I was there—while I was there there were at least five killed.

Senator FRELINGHUYSEN. Five killed?

Mr. DAVIS. Yes, sir.

Senator FRELINGHUYSEN. Explain the nature of those accidents, and which ones you believe were caused by defective machines?

Mr. DAVIS. Well, first, may I explain the other control defect on the Dep control?

Senator FRELINGHUYSEN. Yes.

Mr. DAVIS. That is where they have the wheel on a yoke instead of a stick. I find when you push that wheel forward on some of the Dep machines—they were not all alike—in the front compartment, the instrument board, which is of thin mahogany, had no back bracing, and it would go far enough to allow the cable pulley on this yoke to pass beneath it. For instance, when you pushed the wheel over it would catch, and the tighter you pull back the tighter it would lock. There was an accident there, where two people were killed, one of them being a civilian instructor, who I am absolutely sure was killed due to that defect. The machine was gliding, and suddenly went over this way [illustrating] and tore down backward

this way [illustrating]. If he could have managed that machine he would have gotten it in a tail spin or some other position in order to overcome that. I am absolutely sure that was what caused that one death. There was another accident that I think I am positive was caused by the stick control catching, because the instructor thought that the pupil froze to the control; that is, they were making a turn close to the ground and all of a sudden he felt it jar and lock and both of them were put in the hospital for several hours. I talked about that to them as soon as they could talk. The pupil said he knew he did not freeze onto the control.

Senator FRELINGHUYSEN. What do you mean by "freeze onto the control"—you mean get frightened?

Mr. DAVIS. Yes, sir; the rudder bar is just far enough away to allow him to straighten out with his legs in this position [indicating], and there is nothing the instructor can do to shake him off or cause him to release it, except to shock him off. I tried to get them to let me fix that so that by pressing a button the instructor could shock the pupil off by turning on an electric current. I made the drawings and showed it would be absolutely simple and be absolutely fool proof, but they were afraid to try it. They did not like to experiment.

Senator NEW. They would rather kill somebody?

Mr. DAVIS. Yes, sir; they said they would not like to try it; that they would rather have it go along that way than have a man shocked off when it was necessary to have him have control of the machine. I talked with electrical men who said it could be made absolutely fool proof.

Before going there I suggested to the Curtiss people at the factory that they arrange it so that there would be two sets of controls and they could be cut loose, and made to operate independently, and they said they would try it, but the Government would not allow them to.

Senator FRELINGHUYSEN. What other casualties were there?

Mr. DAVIS. There were two, which were collisions in the air, which are just due to disobeying orders. The only way a collision can happen in the air is that somebody, just as in a railroad wreck, has gone wrong. There is no excuse for a collision in the air. Most of these other accidents were due to tail spins close to the ground, which I am satisfied, in my own mind, were due to that stick control getting caught in that position I have described.

Senator FRELINGHUYSEN. What was your status at the field—were you a civilian in the pay of the Government?

Mr. DAVIS. Yes, sir.

Senator FRELINGHUYSEN. As an instructor?

Mr. DAVIS. Yes, sir.

Senator FRELINGHUYSEN. Are there many in such positions?

Mr. DAVIS. There were 15 at that time.

Senator FRELINGHUYSEN. You held no commission?

Mr. DAVIS. No, sir.

Senator FRELINGHUYSEN. Why did they not commission these men—these instructors?

Mr. DAVIS. Just before I left Gerstner field, orders came through requiring the instructors to accept commissions or be discharged.

Senator THOMAS. Are you still in the employ of the Government?

Mr. DAVIS. No, sir; I am, legally, I claim. For instance, when I was transferred to Gerstner field conditions were so much worse there than at Kelly field that when I offered some suggestions, in the best of faith, and offered to point out a few little things which were absolutely inexcusable, the officer in charge of the flying field got red in the face and blew off and he said, "Do you think you can come over here now and run this field?"

Senator FRELINGHUYSEN. What was his name?

Mr. DAVIS. Kirby.

Senator FRELINGHUYSEN. Were these fatalities which you have spoken of only on Kelly field, or were those fatalities on both fields?

Mr. DAVIS. Those fatalities I have mentioned were on Kelly Field.

Senator FRELINGHUYSEN. Did you observe any fatalities on Gerstner Field while you were there?

Mr. DAVIS. As I remember, there were three while I was there, but I did not witness any of them. I was there on the field at the time, but I did not notice them.

Senator THOMAS. You said you started to make suggestions to the officer in charge, because you found the conditions there worse than at Kelly Field?

Mr. DAVIS. Yes, sir.

Senator THOMAS. Just go into a little more detail about that. That statement needs a little more elaboration.

Mr. DAVIS. I was only connected with the advanced stage in their field, and when I say worse, I am not taking into consideration that I was at Kelly Field part of the time as an efficiency engineer. I meant the condition of the instructor's stage at Gerstner Field was so much worse than the condition at Kelly Field that, for instance, a man could get up and go off at 10 o'clock in the morning and do stunts and not report back and not be missed, and the machine not checked up as missing, and they would not know he was not back until the next morning, when they came to assign a machine to him and would find out he was not there. Then some one would say, "I remember, he went out at 10 o'clock yesterday morning to do stunts, and we have not heard from him." I have known them to send out eight scouts and they report back that they could not find him.

I remember in one instance it was two days before they found him. The orders sent out were that you should not leave the machine until help arrived from the field, and in this case the man, before help arrived, was almost starved. It happened that finally some one in a private conveyance took a note to the field. I made the suggestion to the officer in charge of flying that we had that trouble in Kelly Field and that this was the way I worked it out: For instance, when I went to Kelly Field, they could only use 14 machines in the instructor's stage, and I came so near having a collision, with only 14 machines in the field, that I suggested they lay out the surrounding territory and send these men up, saying to one man, "You go over to sector 7, you to sector 8, and you to 6 or 5, and do your training over there and be back here at a certain time." They painted a large map on the blackboard, of the surrounding country, and this man, when he started out here, they would put a poker chip with the number of his machine and his name and the exact time he was to bring his machine back to the field, down, and so the dispatcher knew just how long he was to be there, etc., and he was not allowed 15 seconds overtime. You could get in five minutes beforehand, but you could

not be a second overtime, and if you were they would immediately send out a man to look you up. Immediately that was put in use there they could use 50 machines instead of 15. I told Maj. Kirby about that and I told him some record ought to be made of these men and of these machines other than these instructors' notebooks, which just said "So and so in such and such a machine." Even the dates were not in the notes kept.

Another thing I told him was that the instructors did not fly alike down there.

Senator THOMAS. Did not do what?

Mr. DAVIS. Did not instruct alike. There were too many bosses in the instructors' stage. For instance, there was a major, and he had an assistant, and this assistant had an assistant, and then the instructor, he had an assistant, and then another assistant. It was absolutely bad. When I went down there I did not expect to be tried out, but I was taken up and told what to do in the air, but this instructor kept his hand on the control all the time, and if I banked just the slightest he would yank it back this way [indicating], and when I came down I said to him, "I can not fly with you on the control lever. You would not be supposed to do that even with a green student." You take a green student up high enough and tell him to take the controls and do what is right, and you tell him, "I will watch you, but do not let go of the handle until I take hold." He treated me not even like a green student. I reported it, and I was told to go up with a man named Johnson. I started with him and pushed the tail over to start the machine up in the air quickly, and he immediately pulled it back, and so I let it go.

He asked me what I was trying to do, and I explained to him what I was trying to do, and he said that they did not allow it, and that I had to let the machine take itself off, which sometimes takes a quarter of a mile, when, as a matter of fact, you can frequently get it off in a few feet. When I told the other men, they got into a scrap over it. I was telling the major about this, too. He phoned down to the hangar to find out what the trouble was, and they told him I could not fly. He said, "You will have to be relieved of flying until this is investigated." I said, "Major, will you come over and let me take a machine and show you whether I can fly or not?" I said, "You just stand on the ground and watch me." I asked him first to take a ride with me. He said, "No, he would have to depend on the reports of the men in charge." I said, "Will you ask him to take a flight with me?" But he would not do that. Then I asked Maj. Smith, the man in charge, if he would take a flight with me, but he said he did not fly the stick machine. I then asked the chief instructor, and he said he would take a flight with me, but when I went back I found the order had been countermanded. Then I was told that I could go back in the morning and my discharge papers would be waiting for me. I said, "What does this mean?" He said, "Because they state that you can not fly." I said, "I can not fly if a man has his hand on the control lever with me." I said I would take my discharge papers, but would have to get them indorsed over to Gen. Squier with the note that for criticizing the efficiency of the school I was charged with not being able to fly. He said that that would not do any good.

Senator THOMAS. When was that?

Mr. DAVIS. That was the 1st of March.

Now, of course, he could not discharge me. He could relieve me of flying. He had to recommend to the commanding officer that I be discharged, and the commanding officer had to send it along with an indorsement, and then the papers would come to me, or at least they would have to notify me I had been discharged. He did not do that, and I had to stay there three weeks before I could get my discharge papers. I gave it up in disgust and came here, and was very much surprised when Col. Brown looked up the papers and found I was discharged on the 1st of March, even though I was not told of it verbally. Col. Brown tried for six weeks to get some explanation from them. Finally he found I was discharged because I was impossible for flying material, and finally that my political influence was such that my services would be retained regardless of my worth to the Government.

Senator FRELINGHUYSEN. You never flew down there alone?

Mr. DAVIS. No, sir; because they did not permit me.

Senator THOMAS. What was the end of it?

Mr. DAVIS. I told them I wanted to straighten that out as far as my record was concerned. I said I had no objection to being transferred to the engineering department and being made an efficiency engineer. I told them I could save them a hundred thousand dollars a week at Kelly Field as an efficiency engineer. They thrashed that out and the engineers said it could not be done, and even if it could they had no authority to employ a civilian in that capacity. They believed that it would be detrimental to the morale.

Senator THOMAS. Gen. Kenly had been put in charge of aviation. Why did you not see him?

Mr. DAVIS. I did, but he said he did not care to overrule the engineers.

Senator THOMAS. Who are the engineers—Col. Brown?

Mr. DAVIS. No, sir; Col. Brown—I told him that a commissioned officer as an efficiency engineer could not get the information that a civilian could; it is absolutely impossible, and that is due to the fact that these men in the shops feel they can only talk to their superior officers—the man immediately above them.

Senator THOMAS. That is the fact, is it not?

Mr. DAVIS. Yes; and now, instead of asking them to change that rule, which, as they say, would affect the discipline down there, if they would allow a civilian to go down there and talk to these men and act as a go-between between the man who knows what he is talking about and who is up against all the trouble, and the remedy, whether that is the commanding officer or the officer in charge of flying, or the engineer, this man can go here and there and get this information at first hand and go over anybody else's head without violating any rules whatsoever. There is nothing to prevent my going to the commanding officer or anybody else and reporting any conditions I want to. Now, the result was a very bad feeling among the men, as a result of the present way of doing business there. When I went there there was no drop light in any one of the 24 hangars. They had to use the flash lights. The few tools they had looked like they had been bought in a 10 cent store. A lot of those have been remedied.

Senator THOMAS. Mr. Davis, you have given us some very valuable information, and we are very much obliged to you for it.

(Whereupon, the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JULY 5, 1918.

UNITED STATES SENATE,
COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment, at 10.30 o'clock a. m., in the committee room, Capitol, Honorable Chas. S. Thomas, presiding.

Present: Senators Thomas (chairman), Reed, and New.

The CHAIRMAN. Mr. William F. Parish will be heard now.

Senator NEW. What is your present relation to the public service?

STATEMENT OF MR. WILLIAM F. PARISH.

Mr. PARISH. I am chief of the oil and lubrication branch, supply section, Bureau of Military Aeronautics.

Senator NEW. How long have you occupied that position?

Mr. PARISH. That particular branch has only been established three days. I was formerly in charge of the lubrication department, Equipment Division, Signal Corps, the lubrication department having been established by orders of January 15, 1918.

Senator NEW. What was your business before you entered the public service?

Mr. PARISH. Mechanical engineer for a matter of 23 years, specializing in lubrication.

Senator NEW. With what companies were you associated during that time?

Mr. PARISH. About 2 years with the Standard Oil Co. of Indiana at Chicago, and then 12 years with the Vacuum Oil Co. of Rochester, N. Y., this period being divided practically 5 years in America and the balance of the time in Europe. After leaving the service of the Vacuum Oil Co. I was manager of the lubricating division of the Texas Co. of New York, and held that position for seven and one-half years, up until October 9, when I entered the Government service.

Senator NEW. October 9, 1917?

Mr. PARISH. October 9, 1917, when I entered the Government service in the specification section, equipment division, Signal Corps.

Senator NEW. Have you been in the public service since?

Mr. PARISH. Yes, sir.

Senator NEW. In brief, what are your present duties? They are described, I know, by the title, but give us some of the things that you particularly look after.

Mr. PARISH. I have written all of the specifications covering petroleum products for use of the United States Army. The main

work that I was employed upon originally was to conduct such tests as were necessary and to write specifications of the oil to be used on the aeronautic engines of the Signal Corps. In conducting these tests and writing the specifications, it was early evident that a very considerable system of lubrication was necessary in order to handle the entire problem presented, and oils outside of those necessary for the aeronautic engines were studied, specifications written, and systems put in for the application of those oils, and for the conservation, not only of the oils themselves, but of the machinery on which they were to be used. In carrying out the plans that were very quickly developed, it was necessary to employ a corps of trained mechanical experts, which I succeeded in securing from the oil industry. These men were placed in the fields, in the aviation schools of the Signal Corps, in order to take charge of the important matter of lubrication of fuel, and of the maintenance of the mechanical equipment.

My present duties consist largely in the administration of the affairs of lubrication of the mechanical equipment of the Bureau of Military Aeronautics, in consultations regarding details affecting the purchase of lubricants for the United States Army by the Quartermaster General's office, as well as consultations affecting the use of lubricants for aeronautic engines belonging to the Navy and of similar duties with regard to lubrication work carried on through the Bureau of Standards, the Bureau of Mines, the oil administrator's office, and many Government and privately owned laboratories working on problems affecting the lubrication of engines, engine design, conservation of petroleum, fuels, and lubricants.

Senator New. In this connection, although it is somewhat of a digression, much has been said about the use of castor oil in connection with aircraft engines—the necessity for it, the difficulties, the expense of getting it, etc. I wish you would state to just what uses castor oil is put, just how essential it is, and whether it constitutes a large or a small part of the total supply of lubricants that is necessary in the lubrication of aircraft motors and machinery.

Mr. PARISH. Castor oil is used almost exclusively abroad for the lubrication of rotary engines of the Gnome and similar types. It is used abroad in some cases by mixing with the mineral oils for the lubrication of the fixed cylinder types of engines, such as the Sunbeam, where mechanical difficulties have made lubrication with straight mineral oils rather difficult.

The program that we have under consideration will require during the next 18 months the use of approximately 20,000,000 gallons of mineral lubricating oil for the lubrication of our fixed cylinder aeronautic engines. The consumption of castor oil necessary for the lubrication of the rotary type of engine is approximately 2,000,000 gallons during the same time.

The CHAIRMAN. During the next 18 months, you mean?

Mr. PARISH. During the next 18 months; yes, sir.

Great difficulty will be experienced in producing even the 2,000,000 gallons of castor oil, as it requires a growing program of unusual size, the expenditure of a great deal of money, and the production is not in the hands of an established industry. It would be a physical and practical impossibility in this country to produce castor oil in the quantities necessary to take care of our complete engine program.

Senator NEW. As a matter of fact, then, castor oil constitutes about 10 per cent of the supply of lubricants needed, and its use is confined almost entirely to rotary engines; is that correct?

Mr. PARISH. Yes, sir; there is another reason why its use must be confined to this type of engine, and that is that lubricating oils used in the rotary engines are completely destroyed by being thrown out of the engine. No conservation program is possible with this type of engine and with this castor oil. On the other hand, with the fixed cylinder type of engine it is possible, with a proper conservation program which we now have in operation, to save practically 50 per cent of all the used oil and use it over again. This can only be done with our apparatus when the oil is a pure mineral product, not mixed with castor oil or oil of vegetable or animal origin, the admixture of such oils making the reclamation impossible.

Senator NEW. If there is anything further that you care to say or that you think should be said upon the subject of lubrication specifically, I should be glad to have you state it; if not, I would like to take up just a little different line of inquiry.

The CHAIRMAN. I would like to ask a question or two.

Mr. PARISH. The subject of lubrication, the entire handling of the lubrication of field machinery for the Bureau of Military Aeronautics is well organized, is in the hands of the best experts that the oil industry could produce, and the operations are in the hands of a well organized concern.

The CHAIRMAN. Do you or not carefully, or otherwise, investigate the merits of proposed lubricants or combinations of lubricants that are brought to your attention by the proprietors of the same, or by those who claim to have invented newer and other and better lubricants?

Mr. PARISH. Yes, sir; we have a regularly organized division to take care of work of this kind.

The CHAIRMAN. Does this organization give the subject complete investigation?

Mr. PARISH. We have a regular system of work in regard to tests, and the tests are conducted by trained men.

The CHAIRMAN. So that you are bound to get comparatively or reasonably accurate results?

Mr. PARISH. Yes, sir.

Senator NEW. Is that all you care to say on that particular subject?

Mr. PARISH. Yes, sir; that is all.

Senator NEW. You are a mechanical engineer, I believe, and in that capacity you have given some thought and attention to the care and maintenance of the airplanes that are delivered to the Government at the various fields for use; is that correct?

Mr. PARISH. Yes, sir.

Senator NEW. Have you personally visited any of the fields at which planes are in use?

Mr. PARISH. Yes, sir.

Senator NEW. How many, and which of them?

Mr. PARISH. Only a few fields. One Navy station and two Army fields.

The CHAIRMAN. Name those, please.

Mr. PARISH. The Navy station is at Bay Shore, Long Island. The other fields were Mineola fields Nos. 1 and 2, and Selfridge field.

The CHAIRMAN. Where is that?

Mr. PARISH. Near Mount Clemens, Mich.

Senator NEW. You spoke of having men located at the different fields as representatives. Do you get reports from those men concerning the maintenance of machines?

Mr. PARISH. Yes, sir; I have a very fine system of reports, both written and oral, and a very fine technical organization that has been studying the question of maintenance of mechanical equipment of the Signal Corps since January of this year.

Senator REED. Are these men that you speak of men who have been practically engaged in the work that they are now doing, or are they theorists?

Mr. PARISH. They are practical men. An expert from the oil industry, is a man who has qualified as manager of a plant, a chief engineer of a steamship, a man who has been the chief expert for a manufacturing plant, who has qualified as a mechanical expert able to handle any mechanical problem in connection with the control and operation of machinery, and the building of machines, and who is selected on account of his mechanical attainments, and on account of his diplomatic handling of men.

Senator REED. In other words, he is a real expert?

Mr. PARISH. Yes, sir; he is a qualified expert.

Senator REED. I can put my question in different language. There are some places where men have been put into the service who have had no practical experience in the branch of work they are now undertaking to handle. I want to know if that condition exists in the department to which you are referring?

Mr. PARISH. No. These are men qualified as mechanical experts of the finest and highest type in this country.

Senator NEW. As I understand it, you are in receipt regularly of reports from these men?

Mr. PARISH. Yes, sir.

Senator NEW. Then I wish to ask you to state generally what the character of those reports is as to the care that is observed and the correctness of methods in the maintenance of the machines which the Government has?

Mr. PARISH. We found in taking up the work of lubrication, which is practically all maintenance work, that in all the fields in which we started our operations no attention whatever was being given to the important subject of lubrication and the handling of fuels and to details in connection with the general care of the machinery. We found generally that the engineer officers in charge of mechanical equipment in the fields were not men who could qualify as experts in mechanical lines. I could be more specific if you want me to.

Senator NEW. Yes.

Mr. PARISH. We found engineer officers at fields whose only qualification as engineers was the fact that they had graduated, after a three months' course in engineering, at the Massachusetts Institute of Technology, and previous to entering that institution these men, according to their Government records, came from practically all walks of life. For instance, in one case, an engineer officer was an expert billing clerk in a freight office; in another case the engineer officer was a bond salesman, previous to that having been a clerk in a bank; in another case the engineer officer, for a matter of six years, was a grocery clerk; in another case, the engineer officer was con-

nected with the tanning business; in another case the engineer officer was employed in the wooden-box business. The lubrication engineers, as a rule, found it exceedingly difficult to operate under these men.

Senator REED. You have told of a number of men who have been graduated at this school of engineering, the Massachusetts Institute of Technology, in three months' time, and what their previous occupations have been. Have you simply singled out certain illustrations of the worst kind, or does that run all the way through, and are there a great many men who are not competent? I want to know if what you have told us is characteristic of the organization or whether it is exceptional?

Mr. PARISH. This seems to be characteristic.

Senator REED. In other words you think, generally speaking, the men who were put in charge of the mechanical division were men of about the kind of experience that you have detailed?

The CHAIRMAN. You mean generally speaking, as far as your investigations have gone?

Mr. PARISH. Yes, sir. Generally speaking, the men who were in charge of mechanical operations in most of the fields were of the type indicated. However, it must be understood in fairness that other fields are operating properly, where regularly trained engineers are in charge of operations, either indirectly, by being placed in inferior positions in the field, or from the fact that the engineer officers were mechanical men before taking the theoretical course at the Massachusetts Institute of Technology——

Senator REED. I want to get this fairly. You have been speaking of certain instances. If those instances are characteristic of the whole organization, I would like to know it. If, on the other hand, those instances, or your knowledge of those instances, has been confined to a certain field, I would like to know that.

Mr. PARISH. Not only does the condition already described exist at the fields, but here in Washington the men who are in charge of these highly technical engineering matters are not engineers. They are fine men, good officers and, in some cases, good fliers, but they are not mechanical engineers. There does not seem to be a single practical experienced mechanical engineer in a position of authority among the officers operating these flying fields. Under these circumstances, the conditions at the fields are better than might be expected. Senator, I want to bring out that the entire situation that we have found in the field in connection with the maintenance of mechanical equipment is due to a fundamental weakness in the organization of our War Department.

Senator REED. Now, what is that fundamental weakness?

Mr. PARISH. Our War Department is organized on the basis of animal power. The commanding officer of a field or post has control of the operations of that field or post. It is in his power to select men for all branches of the service at his post, with the exception of the highly technical branch of medicine, of the civil engineers, and the more or less technical branch handled by the quartermaster.

Formerly, when the Army operated entirely with man, horse, and mule power and had no machinery, the general knowledge possessed by nearly everyone in connection with the handling of animal power problems was such that an officer could be easily trained and his

entire personnel under him were more or less familiar with every phase of the work.

Senator REED. You mean to say that, having nothing more technical than a battery or an Army wagon, they could learn that without technical training?

Mr. PARISH. Yes, sir; and that the Army, being composed largely of recruits from small towns and farms, was made up of men who were more or less familiar with the handling of such equipment as horses and wagons. Now, within a very few years, we have turned over to the Army precision machinery of the finest kind, mechanical tools, implements, and engines of design and build that we in this country have heretofore had very little to do with; and this valuable and complicated machinery is turned over to the care of an organization designed for taking care of something entirely different.

Senator REED. That is, you mean to say that the time required for a man to qualify himself to handle a mule team may not qualify him to run an automobile or to handle the engines in an aeroplane, or do other similar work where he deals with intricate machinery?

Mr. PARISH. The operation of a motor truck can be taught to men who are not mechanically apt; the operation of a flying machine can be taught to men who are not at all mechanical. In fact, our fliers are selected from all walks of life, and are young men not all possessed in the slightest degree of technical or mechanical experience which would enable them to take care of the machinery, but they can operate it.

Senator REED. I suppose I used the wrong term.

Mr. PARISH. No, Senator; the word "operation" is used a great deal in talking about maintenance, even by men conversant with the subject.

Senator REED. Well, that is not just what I mean. I know that I can run an automobile, for instance, if somebody else can fix it so that it will run, but I can not fix it myself.

Mr. PARISH. The field commander generally assumes that it is easy to detail persons to take care of his mechanical equipment, and that all that is necessary in regard to the proper maintenance of machinery is simply the detailing of the personnel; whereas, as a matter of fact, the personnel must be selected and trained and centrally controlled in exactly the same way as the operations are conducted in the administration of the medical department, which has to do with the technical problem of health of the troops and the sanitation of the camps. That matter of the health of the troops is not left to the individual field commanders to do with as they please.

Senator REED. I am afraid that I have led you astray by my questions. You were describing the character of the men who were engaged in this technical work, and I suppose you intended to pursue that subject and tell what the results were.

Senator NEW. To get back to the thread of your story, Mr. Parish, tell us what are the results that have been obtained, so far as you have been able to observe.

Mr. PARISH. In connection with the use of lubricants in the field, at the time of taking up this work and studying it, there were 22 different kinds of oils used in the flying fields, upon practically the same class of equipment.

The CHAIRMAN. Did these oils comprise those which your division recommended as lubricants?

Mr. PARISH. No, sir. This was before we had written our specifications and before we had systematized the subject of lubrication. In all fields the oil that was removed from the engine after from 5 to 10 hours' run was thrown away and wasted. In many fields we found dirt in the oil that was taken from the engine, this dirt being in the engine through carelessness.

In regard to the maintenance of machinery, outside of the lack of proper lubrication, we found many instances that indicated that the work was not at all organized. In several of the fields where the work was being conducted under the control of engineers of training a serious attempt had been made to systematize and to get things into good, practical shape. We found, however, that where one field was well organized and was operating in a satisfactory manner the field next to it had no method or way of getting the benefits of the results of the work in the first field, due to the fact that there was no organization of a central nature for the control of the mechanical affairs, or the collection and redistribution of technical facts in relation to the maintenance and care of this particular kind of machinery.

The CHAIRMAN. Can you name the fields which had good organizations and those which did not?

Mr. PARISH. There are some 28 fields, and I would not be prepared to give you a statement offhand.

The CHAIRMAN. Since the matter of lubrication has been systematized and placed in competent hands, have these conditions improved?

Mr. PARISH. In all except six or seven fields, where we have had difficulties with engineering officers and commanding officers in getting established.

The CHAIRMAN. Can you name those fields?

Mr. PARISH. Rockwell field, at San Diego, Cal.; Ellington field, Tex.; Gerstner field, Lake Charles, La.; Barron field, Everman, Tex.; Love field, Dallas, Tex.; Taylor field, Montgomery, Ala.; and Post field, Fort Sill, Okla.

At these fields, due to the difficulties that I have experienced in having the lubrication work firmly established, our operators at this moment being civilians operating in a military establishment, we have not been allowed to properly organize and operate.

The CHAIRMAN. Do you know of any instances in which machines have been put out of commission, so to speak, or rendered useless by lack of care?

Mr. PARISH. At Kelly Field, San Antonio, there were a number of new planes of a value of nearly half a million dollars ruined in a very short space of time, due to a lack of care. Water was allowed to freeze in the engines and radiators, and oil was allowed to remain in the engines. Wires and unprotected metal parts rusted. The wings, being not properly supported, warped. The fuselages were bent out of shape, because the machines were not properly supported. Propellers warped and were ruined by dampness. The damage was caused in a matter of a very few weeks, resulting in a total loss of the equipment.

The CHAIRMAN. About when was that?

Mr. PARISH. Last fall and winter. This was a matter of judicial inquiry through the Inspector General's office.

The CHAIRMAN. Was that Col. Chiddy, commander?

Mr. PARISH. I do not know that, Senator.

The CHAIRMAN. Do you know whether similar conditions prevailed at other fields?

Mr. PARISH. I have records covering a lack of maintenance of equipment from a great majority of the fields.

The CHAIRMAN. Will you add that to the record?

Mr. PARISH. Yes, sir. None of the records, however, cover individual amounts as great as the one just indicated.

The CHAIRMAN. As great?

Mr. PARISH. Yes; no one as great in amount as the total sum indicated.

(The records referred to are here printed in full, as follows:)

Mechanical maintenance consists in looking after a large number of details concerning each class of equipment and concerning each machine. It is hardly practical to enumerate at this time a mass of details, each in itself small but in the aggregate representing the loss of large sums and the damage or loss of equipment that is very difficult to replace. It may be well, however, to mention certain fundamental defects.

(a) There is no central, uniform or comprehensive system of records and scientific information. Each field has a report and record system of its own, devised by the officers at that particular field. This means 28 sets of forms and 28 different ways of keeping records.

(b) Each field orders supplies and spare parts in its own way. This results in great confusion and inefficiency. Parts are ordered in such quantities that in many cases they can not be supplied. One field will have enough of certain spares to last for years and the next field will have planes out of commission for lack of those same spare parts. Failure to properly care for a machine results in the need of many spare parts, while proper care greatly reduces the spare parts needed.

(c) Lack of uniform methods in all respects makes it necessary, when a man is transferred from one field to another, for him to forget what he has learned, and learn the procedure and methods of the new field.

(d) Most of the fields are in dry, semidesert country and the propellers throw up great quantities of sand and dust while the machines are warming up and when they start to ascend. This dust is blown into the hangars and is very injurious to the engines, to say nothing of the men. The suggestions to oil the fields have not been accepted, although it is on record that serious accidents have occurred due to the dust.

(e) Engines have been damaged and ruined by having been started up when cold, due to lack of care and to lack of equipment for properly heating the engines during cold weather before starting. Water and oil are heated on the field over open fires.

(f) Proper maintenance is largely a question of trained personnel. At present men are selected for the enlisted mechanics' training schools by their officers. Good men are kept at work and men without mechanical skill or aptitude are sent to the schools. Good men are thus deprived of the much needed intensive technical training, and the training frequently given to men unsuited to profit fully from the training. The same conditions in general apply to the officers' training schools. Not only should these conditions be remedied, but the schools should be coordinated and the best men from the enlisted mechanics' schools should be sent to the officers' training schools.

The CHAIRMAN. Mr. Parish, are the oils, the mineral oils, which you and your assistants recommend as lubricants, as good as the castor oil which is said to be the chief lubricant used abroad?

Mr. PARISH. The mineral oils which are being used in all the fields now for the lubrication of the fixed-cylinder type of aeronautic engines are superior in practically every respect to castor, when castor is used on the same engine, for this reason: The mineral oil will leave the engine cleaner and the engine will not require cleaning as often. The mineral oil can be reclaimed, which amounts to a practical saving and reusing of 50 per cent of the oil. The mineral oil at present is costing approximately 60 cents per gallon bulk, delivered in the field, whereas castor oil would cost \$2.50 per gallon in the field.

The CHAIRMAN. If I understand you, the aviation program is not at all dependent upon the use of castor oil as a lubricant?

Mr. PARISH. Yes, sir. With the exception of the rotary engines. The CHAIRMAN. They are not being largely manufactured, are they? In other words, the use of the rotary engine forms a very small part of our aviation program, does it not?

Mr. PARISH. Yes, sir.

The CHAIRMAN. And no part at all of the fighting program?

Mr. PARISH. Rotary engines have been used in large numbers by the French and British on fighting machines.

Senator REED. What, if anything, did you have to do with bringing about a condition where mineral oil is used instead of castor oil?

Mr. PARISH. When I entered the Government service in October, one of my first duties was to attend a meeting of a commission appointed for the purpose of considering the castor-oil program. At that time I went on record to the effect that I would oppose the use of castor oil for the fixed-cylinder type of aeronautic engines, which included the Liberty engine then being redesigned.

Senator NEW. What are the fixed-cylinder engines, and what are the rotaries that we are now making?

Mr. PARISH. The fixed-cylinder engines include the Liberty, the Hispano-Suiza, the Curtiss, the Hall-Scott, the Rolls Royce, the Sunbeam, the Sturtevant, and the Italian machines, the Fiat and Isotta Fraschini, and all engines designed to deliver more than 150 horsepower.

Senator REED. They practically include all except two or three types?

Mr. PARISH. Yes, sir. The rotary types are the Le Rhone and the Gnome. Those are the only ones we build in this country.

Senator REED. State more fully, if you can, what was said about the character of oil to be used.

Mr. PARISH. This commission was under the impression that castor oil would be necessary for the Liberty as well as for all other types of engines, as about that time Mr. Howard Coffin was credited with an article in the Saturday Evening Post which seemed to be a leader—and there were similar articles by the same author—to the effect that castor oil was absolutely essential for the lubrication of the Liberty engine. At this time I knew the figures with regard to the engine program; I knew the number of gallons of oil that would be necessary to lubricate these engines, and had looked up all the facts in regard to the production and use of castor oil; and I knew the impracticability of operating a program the size of the one we had entered upon with castor oil, due to the lack of production. Further, it is well known among mechanical experts and lubricating engineers that any piece of machinery designed in such a manner that it will not operate successfully with mineral oil is suffering from either a mechanical or structural weakness or defect of a metallurgical nature. My position in the matter was, and has been all along, that if our engineers were not able to design an engine that could run properly with mineral oil they should go over their work or get other engineers to adjust the matter for them. I did not correct the statement in regard to castor oil at the time for the reason that I considered this information was very good publicity work if we desired to mislead the enemy, as he would be very well able to get the same information I had in relation to castor oil production and knew, as I did, that a machine that required oil of this kind was weak structurally or from

a metallurgical standpoint, and he would be able to figure up from the available production of castor oil the total number of engines on our program, which necessarily would be a very small number compared with those actually contemplated.

So I made no effort whatever to correct the published statement, but I have since been criticized for this by Mr. Creel's office.

Senator REED. You say that there is a fundamental defect in our organization in the Army. You have gone into some detail as to what brought this condition up; that is to say, formerly we had no machines, practically speaking, while now we have, and yet we have not changed our methods of operation. What is your suggestion as to what should be done in order to properly take care of the modern machines that are now being employed?

Mr. PARISH. In order to properly take care of the maintenance of the mechanical equipment of the United States Army, or of the Department of Military Aeronautics, it is necessary to have scientific control in exactly the same way that the Medical Department has control of the health of the troops and the sanitation of the camps. A department should be organized charged with the care of the mechanical equipment and should have the administration of affairs which are at the present time being covered in various ways. In attempting to take care of mechanical equipment through base supply shops, aviation camps, and overseas, an organization of officers and men selected and properly trained, constituting the mechanical personnel, should be technically controlled in exactly the same way as the Medical Department control their forces. Standard and scientific systems of maintenance, operation, and control of mechanical equipment should be established and placed in charge of a technical overhead organization with the same powers in regard to taking care of the machinery as the Medical Department now has with regard to taking care of the health of the troops and the sanitation of the camps.

The CHAIRMAN. In other words, they should have full control and corresponding responsibility?

Mr. PARISH. Yes, sir.

Senator REED. You would add to that that these technical men should have under them thoroughly trained mechanics who know their trades and business, and who are not educated in from two to three months in a subject that ordinarily requires from five to six years' experience?

Mr. PARISH. The men of the entire mechanical personnel should be selected on the basis of their former experience in the necessary trades and should receive special and intensive training along the lines necessary, and this training should be practical and not theoretical. These men should further be placed in charge of officers who are selected on account of their previous training and suitability for the work, and not as at the present time. They should all be controlled and required to operate on a uniform basis, so that the operations of all the fields will be similar and that no one field will lag back of another in regard to maintenance and all details in connection with the maintenance of machinery.

At present every field is a unit by itself.

The CHAIRMAN. Have you anything further to say?

Mr. PARISH. I think that is all, Senator.

(Whereupon, at 11.30 o'clock a. m., the committee adjourned until 10 a. m., Monday, July 8, 1918.)

THE TEXAS CO.,
New York, July 19, 1918.

HON. CHARLES S. THOMAS,
Chairman Committee on Coast Defenses,
United States Senate.

MY DEAR SIR: I am in receipt of your letter of July 17 requesting information about Mr. W. F. Parish.

I have known Mr. Parish for several years, during which he was connected with our company in the capacity of lubricating engineer expert, in charge of the staff dealing with technical questions relating to lubrication.

Previous to his connection with our company he was for several years in the employ of the Vacuum Oil Co. as a lubricating engineer, and was, I believe, located in Europe during the greater part of the time he was connected with that company.

Mr. Parish was for several months assisting the Signal Corps, Aviation Section, having been granted leave of absence by The Texas Co. for this work. Later he resigned his position with The Texas Co. and continued his work with the Signal Corps. He has not been connected with our company in any way since January 22, 1918.

We employed Mr. Parish in January, 1911, to assist us in developing our rapidly growing lubricating business, and at the time of his employment we considered him one of the leaders among lubrication engineers, and his work with us confirmed our opinion. I believe his integrity is beyond question.

The specifications which were prepared by Mr. Parish for lubricating oils did not favor our company, nor to my knowledge any other company, but were broad enough to make it possible for us as well as many others to submit oils for test. Since those specifications were issued The Texas Co. has furnished but a very small percentage of the lubricating oils used for aeroplane lubrication.

Yours, very truly,

E. C. LUPKIN.

EASTERN POINT,
New London, Conn., July 22, 1918.

HON. CHARLES S. THOMAS,
United States Senate.

SIR: Your favor of the 17th has been forwarded to me here. Mr. W. F. Parish was in the service of our company for a number of years as chief of our technical department, resigning several years ago because he no longer cared to live abroad where we desired to continue the use of his services.

We considered Mr. Parish an able engineer, thorough in his work, and always desirous of ascertaining the real facts of any problem submitted to his consideration.

We believe he has approached the whole question of specifications for lubricants for the aviation service with open mind and with the single purpose of ascertaining not only suitable oils but enabling the largest source of supply by accommodating the specifications to the limitations of several types of crude oils.

While the specifications worked out by him for oils from crude of a paraffin base conform to our own experience and the judgment of our engineering force, they do not favor our products as against those of other manufacturers, since refiners operating on similar crude should be able to produce oils that conform to the required tests.

We desire to point out that long before Mr. Parish had issued his specifications we were so oversold on oils for motor cars and aviation service we were seeking no new business, but, on the contrary, were obliged to refuse a large number of orders; and our correspondence with Mr. Parish pointed out the necessity of specifications as far as possible as would insure the largest possible supply. We have reason to believe he had this in mind, at the same time endeavoring to designate oils both safe and economical to use.

Respectfully,

EDWARD PRIZER, President Vacuum Oil Co.

CATARACT REFINING & MANUFACTURING CO.,
New York City, June 29, 1918.

Hon. CHAS. S. THOMAS,
Chairman Subcommittee of Senate Committee on Military Affairs,
Washington, D. C.

SIR: Mr. W. F. Parish, in charge of lubrication department, aircraft production, has written me in connection with charges preferred against him by Edw. G. Acheson to the Military Affairs Committee, with which is inclosed copy of his letter of June 6, addressed to you, subject "Aircraft investigation."

It may interest you to learn that the writer has known Mr. Parish for the past 10 years, during which time have had ample opportunity of judging his work and methods and while at times have not agreed on certain points, have always found Mr. Parish open to conviction and hold a high opinion of his integrity and honesty of purpose. Furthermore, believe Mr. Parish is serious in his work and remarkably free from bias in his judgment in the selection of lubricants and drawing up of specifications thereof in connection with the work he is now doing. Also consider his past experience as a technical engineer in charge of important tests while employed by a large oil company abroad and with a company of similar importance in this country has given him a broad knowledge of the engineering value of lubricants, and therefore think his work and judgment in matters concerning lubrication can be relied upon as fair, impartial, and competent.

Respectfully,

L. H. ATKINSON, Sales Manager.

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
Washington, June 22, 1918.

From: Office Director of Military Aeronautics.

To: Hon. Chas. S. Thomas, Chairman Subcommittee of Senate Committee on Military Affairs.

Subject: Lubricants for aircraft engines.

1. Further answering your letter of June 12, 1918, the following preliminary statement is made, as referred to in the last paragraph of your letter and in our reply of June 17, 1918.

2. When Mr. W. F. Parish was employed to write specifications for lubricants, primarily for aircraft engines, the entire matter was in a chaotic condition. Almost every oil company made one or more oils which it represented as ideal for lubricating airplane engines. The aviation fields that were then in existence used about 25 different grades and makes of oil, in some cases blending their own oil by mixing two or more grades and in other cases using mixtures of mineral oil and castor oil. This condition of disorder and lack of organization extended even to the factories of the engine builders, and no two engine builders could agree upon the same make or grade of oil, each using some special product which he thought was the best thing to use in connection with his particular engine.

3. In order to secure scientific data necessary to properly write specifications, 47 tests of oils were conducted, each oil being tested for five hours in modern aeronautical engines, by experts, in the most scientific manner possible.

4. As a result of these tests, and after conferences with representatives of the United States Army, the United States Navy, and the American Society for Testing Materials, Specification No. 3501 for Liberty aero oil was written. This specification calls for a straight mineral oil, which can be manufactured by practically every refiner in the country, and can be made from almost any grade of crude oil, whether Eastern, Western, or Mid-Continental. Eight of the leading refiners of the country are now producing Liberty aero oil for the United States Government, and there are 15 other refiners who have submitted samples and are on the tentative approval list until such time as their oil has received final test and approval. All purchases are made by the oil branch of the Fuel and Forage Division of the Quartermaster's Department, and the lubrication department has nothing whatever to do with such purchases.

5. In order to expedite the tests of oils an attempt was made to eliminate all but established products. Only such materials as had been successfully used in the lubrication of aircraft motors were to be tested. The "Oildag" was thoroughly investigated and the reports received not only did not substantiate the claims of the company, but were of such an adverse character that the lubrication department is probably subject to criticism for having tested a product which did not strictly comply with the requirements of being established and in successful use on modern aeronautical motors. The test of "Oildag" was made after the lubrication department

had been assured that any damage to the motor would be made good, and after considerable correspondence had taken place concerning the details of the test, such as its duration and the very light viscosity of the oil containing "Oildag" in comparison with other oils for aircraft engines which were all much heavier. The test of "Oildag" was conducted just the same as the other oil tests and the results obtained were not at all inconsistent with the other tests. For example, the excessive consumption was exactly proportional to the viscosity when compared with other oils tested.

6. The lubrication department's file concerning Dr. Acheson and "Oildag" consists of over 132 communications of which about 36 are published in Dr. Acheson's pamphlet of 60 pages. It is not considered necessary to encumber the record at this time by quoting more of this voluminous correspondence. It is believed that the correction of the most conspicuous errors in Dr. Acheson's letters accompanying the pamphlet, and in the pamphlet itself, will enable your committee to obtain the controlling facts from the small part of the record published in the pamphlet.

7. (a) Dr. Acheson is misinformed when he states that "Mobiloil B" and "Texaco" are the lubricants adopted for the Liberty Motor. An examination of the Approved List of Liberty Aero Oils attached will show that the Texas Co. makes one of the nine approved Liberty Aero Oils, but this oil was not approved until May 31, 1918. "Mobiloil B" is not approved and no oil made by that company (Vacuum Oil Co.) is on the approved list. This company has submitted Gargoyle Mobiloil "L," which has passed the laboratory test and is, therefore, on the tentative approval list along with 14 others, a list of which is also attached.

(b) Dr. Acheson is also mistaken when he says: " * * * plain petroleum will not lubricate the Liberty Motor * * * ." It is a matter of record that the Liberty Motor is at the present time built only to use Liberty Aero Oil, Specification No. 3501, which is a straight mineral oil, and 84 per cent of the oil at the flying fields is Liberty Aero Oil.

(c) Dr. Acheson asserts that the Germans are using "Oildag." This department has been unable to verify the doctor's assertion. On the contrary, we have no less than five analyses of oils taken from different captured German airplanes, every one of these analyses showing a straight mineral oil without compounding with castor or with graphite.

(d) Dr. Acheson does not seem to realize that there is a radical difference between an automobile motor, with cast-iron cylinders, and the modern high-speed, aircraft motor, which has steel cylinders and aluminum pistons. This fact must be borne in mind when considering testimonials concerning the use of "Oildag" in automobile motors. Dr. Acheson's claims for "Oildag" are apparently based very largely upon automobile experience. There is nowhere in the record any evidence as to the merit of "Oildag" as a lubricant for modern aircraft engines.

8. "Oildag" is 12 years old. In speaking of his company's efforts to market the product, Dr. Acheson says: "The Oildag Co. found itself confronted with an insurmountable obstacle," and in another place he says, "The results met with were not all that had been hoped for." In other words, in 12 years, in spite of the efforts of so able a man as Dr. Acheson, "Oildag" is not much used and is of little commercial importance. An examination of the full record will disclose that its use seems to be confined very largely to the working in of new motors at the factory.

9. Your committee will probably agree that it is entirely proper and scientifically correct for lubrication matters to be in the hands of the best lubrication experts which the petroleum industry affords. Dr. Acheson takes the stand that such men are prejudiced against graphite as a lubricant and that a mechanical engineer should pass upon the matter. For this reason it is not deemed necessary to give any further answer at this time to Dr. Acheson's assertions that the test of "Oildag" was unfair and biased.

10. In case you desire to look up Mr. W. F. Parish's standing in the oil business, we respectfully refer you without permission to the following men: Mr. Edward Prizer, president Vacuum Oil Co., 61 Broadway, New York City; Mr. E. C. Lufkin, president Texas Co., 17 Battery Place, New York City; Mr. A. C. Bedford, chairman Petroleum Advisory Committee, 26 Broadway, New York City; and to Mr. Frank Vanderlip, City Bank, New York City, as to his general character and integrity. Full and detailed information regarding Mr. Parish's professional record may be obtained from the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York.

11. This department wishes to again assure you that you can count upon our co-operation and our full assistance in any manner desired by you.

By direction of the Director of Military Aeronautics.

W. F. PARISH,

Chief Plane and Engine Maintenance Branch, Supply Section.

BUREAU OF AIRCRAFT PRODUCTION,
LUBRICATION DEPARTMENT.

TENTATIVE APPROVAL LIST, SPECIFICATION NO. 3601, LIBERTY AERO OIL.

[Complete as of June 7, 1918.]

Atlantic Refining Co., Philadelphia, Pa., Atlantic Aero; Buffalo Refining Co., Buffalo, N. Y., Buffalo Aero; Crew Levick Co., Philadelphia, Pa.; Foco Oil Co., Franklin, Pa., Aerylub; Galena-Signal Oil Co., Franklin, Pa., Galena Aero; Invader Oil Co., New York, N. Y., Invader Airplane; New York Lubricating Co., New York, N. Y., Monogram A; Swan & Finch Co., New York, N. Y., Aerul Heavy; Tidewater Oil Co., New York, N. Y., Veedol; Union Oil Co., Los Angeles, Cal., Union Aero; Union Petroleum Co., Philadelphia, Pa.; Vacuum Oil Co., New York, N. Y., Gargoyl; Mobiloil "L"; White & Bagley Co., Worcester, Mass., Oilzum E. H.; White Star Refining Co., Detroit, Mich.; Cataract Refining & Manufacturing Co., Buffalo, N. Y.; Galena-Signal Oil Co., Franklin, Pa., Trigram Liberty Aero Oil; Galena-Signal Oil Co., Franklin, Pa., Galsig Liberty Aero Oil; Standard Oil Co., California, San Francisco, Cal., Zerolene Liberty Aero Oil; Wolverine Lubricants Co., New York, N. Y., Wolfshear Liberty Aero Oil; Gulf Refining Co., Pittsburgh, Pa., Gulf Liberty Aero Oil; The Texas Co., New York, N. Y., Texaco Liberty Aero Oil; Borne, Scrymser, New York, N. Y., Borne Liberty Aero Oil; Sinclair Refining Co., Chicago, Ill., Opaline Liberty Aero Oil.

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF AIRCRAFT PRODUCTION,
Washington, June 17, 1918.

MY DEAR SENATOR: I have the honor to acknowledge your letter of June 12 inclosing copy of a letter, dated June 6, from Edward G. Acheson, also copy of pamphlet published by Mr. Acheson, which you loaned this department. This pamphlet will be returned as soon as we receive a copy from another source.

Complying with the suggestion contained in the second paragraph of your letter, we shall prepare a preliminary statement which we will place in your hands within a few days.

You can count upon the hearty cooperation of this department. We shall be glad to assist you in any manner within our power.

Very truly, yours,

W. F. PARISH,
In Charge Lubrication Department.
By ORREL A. PARKER,
Executive Section.

HON. CHAS. S. THOMAS,
United States Senate, Washington, D. C.

ACHESON CORPORATION,
New York, June 18, 1918.

HON. CHARLES S. THOMAS,
United States Senate, Washington, D. C.

MY DEAR SENATOR THOMAS: This morning I am in receipt of a letter from the War Department, copy of which I inclose herewith. The 10 pamphlets, together with the transmitting letters, have been sent forward as requested.

Thinking that you will want to be informed regarding everything pertaining to this matter, I shall, as at present, send you advice as to all developments.

Respectfully, yours,

E. G. ACHESON.

WAR DEPARTMENT,
EQUIPMENT DIVISION, LUBRICATION DEPARTMENT,
Washington, D. C., June 17, 1918.

From: Office Director of Aircraft Production.

To: Edward G. Acheson, 35 West Forty-second Street, New York City.

Subject: Pamphlet recently sent to Congressmen.

1. It is requested that you furnish this department with about 10 copies of the pamphlet which you have recently sent the Members of Congress, together with copies of your letters transmitting these pamphlets.

2. It is requested that this matter receive your prompt attention in order that our reply may not be unduly delayed.

By direction of the director of aircraft production.

W. F. PARISH,
In charge Lubrication Department.
ORREL A. PARKER,
Executive Section.

JUNE 12, 1918.

Hon. W. F. PARISH,
Bureau of Aeronautics, Washington, D. C.

MY DEAR SIR: I beg to inclose a letter of the 7th instant from E. G. Acheson regarding lubricants for aircraft engines, as preliminary to an investigation of the subject by the subcommittee of the Senate Committee on Military Affairs.

The subcommittee would welcome any preliminary statement which you may see fit to make by way of reply to Mr. Acheson's assertions, our purpose being to ascertain all the facts regarding aviation conditions rather than to determine personal differences.

Very respectfully, etc.,

ACHESON CORPORATION,
New York, June 12, 1918.

Hon. CHARLES S. THOMAS,
United States Senate, Washington, D. C.

DEAR SIR: Since writing you under date of the 6th instant I have been advised by my English company, E. G. Acheson (Ltd.), of 5 Chancery Lane, London, that they have received an order for 6 tons of concentrated Oildag from the French Government for use in the aviation section. Six tons of concentrated Oildag when mixed up ready to use is equivalent to 88,800 United States gallons.

Believing this has a bearing on the subject I had written you on, I thought it best to advise you of this fact.

Respectfully, yours,

EDWARD G. ACHESON.

JUNE 12, 1918.

Hon. W. F. PARISH,
Bureau of Aeronautics, Washington, D. C.

MY DEAR SIR: I beg to inclose you herewith a letter of the 6th instant from Mr. Edward G. Acheson, regarding lubricants for aircraft engines, preliminary to an investigation of the subject by the subcommittee of the Senate Committee on Military Affairs.

The subcommittee would welcome any preliminary statement which you may see fit to make, by way of reply to Mr. Acheson's assertions, our purpose being to ascertain all the facts regarding aviation conditions, rather than to determine personal differences.

Very respectfully, etc.

ACHESON CORPORATION,
New York, June 6, 1918.

Subject: Aircraft investigation.

Hon. CHARLES S. THOMAS,
United States Senate, Washington, D. C.

MY DEAR SIR: In the course of your investigation of this important subject, your attention has no doubt been directed to the fact that the life of an aeroplane engine is only 75 to 100 hours of operation, and that this makes it necessary to have ready at the point of use at all times, a large reserve of engines.

Therefore, I believe that your committee would be interested in the question whether the responsible officials in the War Department have availed themselves of feasible means of extending the period of effective operation of aeroplane engines. If this period can be extended 50 per cent, it is obvious that this is equivalent to half as many more aeroplanes in service at any given time.

For about nine months I have been strenuously and continuously endeavoring to have the Bureau of Standards and the War Department make tests of a lubricant

which I have every reason to believe would solve the problem of aeroplane lubrication and thereby materially lengthen the life of the engine, and also add to the factor of safety in operation.

The inclosed pamphlet, which contains copies of the correspondence on this subject, will show that my efforts have been fruitless and that after what I consider an insufficient and wholly unscientific test, the lubricant in question has been definitely rejected by the War Department, and that the circumstances are such as to warrant the inference that such rejection was due, not to lack of merit of the lubricant, but to selfish motives of the official having charge of the matter of aeroplane lubrication.

The official in question is Mr. W. F. Parish, who, in the correspondence, describes himself as being in charge of the lubrication department of the office of the Chief Signal Officer of the War Department. I am informed that before he became connected with the War Department Mr. Parish was vice president of the Texas Oil Co., having charge of its sales department and that for many years prior to that time he was in the sales department of the Vacuum Oil Co. That his authority in all matters pertaining to lubrication of aeroplane engines is supreme is clearly indicated by the fact, as shown by the correspondence, that every communication sent by me, whether addressed to the President of the United States, the Chief Signal Officer of the Army, the chairman of the Aircraft Production Board, or any one else, including even communications questioning Mr. Parish's disinterestedness, with the precision of clock-fell into the hands of Mr. Parish for attention. The magnitude and importance of the lubrication department is indicated by Mr. Parish's own statement (see p. 59 of the pamphlet), "that the lubrication department of the Equipment Division, Signal Corps, is at present in charge of a practical engineer, who has had 25 years' experience as a lubrication expert in this country and abroad, and that there are associated with this engineer about 75 of the best lubrication engineers in the country, these experts having been secured from the petroleum industry and detailed to the various fields to give their best attention to the lubrication of the aeroplane engines." The practical engineer in charge obviously is Mr. Parish himself, and it is equally obvious that every so-called expert in this important department is a man who heretofore at least has been interested in the marketing of petroleum oil.

You will recall that a few months ago the whole country was stirred up over the question of obtaining an adequate supply of castor beans for the manufacture of castor oil to be used in aircraft lubrication. By reference to Mr. Parish's letter of May 3, 1918 (see p. 59 of the pamphlet), you will note that he states that "castor oil is only to be used for rotary type engines and arrangements have been made for a sufficient supply of this oil for our purpose," and that he intimates that a satisfactory lubricant has been obtained for the other types of engine, including, of course, the Liberty motor. I have been informed that the lubricants so adopted for the Liberty motor are the petroleum oils known as "Mobiloil B" and "Texaco," the former manufactured by the Vacuum Oil Co. and the latter by the Texas Oil Co. Now, it may be that these oils are satisfactory—I do not know. The frequency of accidents at the various training camps and elsewhere, as reported in the daily papers, in some of the accounts of which there are intimations that faulty lubrication was the cause of the breakdown of the engine and its consequent fall, would suggest that a satisfactory lubricant has not yet been found. If it is true that Mr. Parish has selected the two kinds of oil in which he was personally interested before he became connected with the Signal Corps, then I respectfully submit that it is a very grave question, into which there should be fullest inquiry, whether all means have been exhausted of determining the best lubricant for aeroplane engines.

As shown by the pamphlet, I have for months been endeavoring to have a test made by disinterested and competent persons, of the product known as "Oildag." Without burdening you with technical details, I will say briefly that this product is what is known as colloidal graphite suspended in petroleum oil. It has proven to be far superior to ordinary lubricating oil on the lubrication of internal combustion engines. For months the British Army has been conducting very extensive tests of Oildag in aeroplane operation, and my English company has supplied the British Government with thousands of gallon charges. In the pamphlet you will find evidence that the German Government is using this product.

You may ask why, if Oildag is what I claim it to be, Mr. Parish would reject it even though he were not disinterested, when its use would not supplant petroleum oil. It is quite true that the amount of graphite suspended in oil is very small, being only one-fifth of 1 per cent in weight. There are two answers to this question. In the first place, if I am right in my claims as to the benefits to be derived from the use of Oildag, its use would very substantially decrease the amount of oil used for lubrication, and in the second place it would be unnecessary to use expensively treated oils, as any good neutral oil having certain physical properties would suffice. Now Mobiloil B and Texaco are very high priced oils, and the amount of oil to be consumed by aeroplanes will be enormous.

You may say, very naturally, that I, too, am prejudiced and I frankly admit it, but there is just this difference. As the correspondence shows, I have placed myself on record (see p. 38 of the pamphlet) as offering this product to the United States Government at net cost. Therefore, I could not personally profit one cent from the Government if my product should be accepted. Furthermore, I have never asked the Government to accept Oildag on my say so. I have made claims as to what it would do and have submitted evidence, but the thing that I have insisted on from the beginning has been that there should be a test by competent and disinterested persons under actual operating conditions. I submit that such persons should not be selected from the petroleum industry, but should be mechanical engineers of national reputation and Army officers having responsibility for the operation of aircraft. I have been informed that unofficial tests have been made by or under the direction of Army officers and that the results were eminently satisfactory. As Mr. Parish's own letter shows (see p. 50 of the pamphlet), the only test of Oildag ever made by him lasted only four hours, and he says that the lubrication was satisfactory. Any competent engineer will tell you that a test of only four hours is absolutely worthless and inconclusive. Subsequently, Mr. Parish informed me (see pp. 49 and 50 of pamphlet) in effect that the reason why Oildag had been rejected was on account of the carbon formation. This statement is so directly in conflict with all the evidence I have on the subject, extending over many years, that, to speak bluntly, I do not believe any such result was shown.

You will note also that there is a direct issue of fact between Mr. Parish and myself on the point as to whether the Germans have been using colloidal graphite in the lubrication of aeroplane engines. In his last letter, however (see p. 59 of the pamphlet), he dismisses this as being of no importance whatever, by saying "however, regardless of the German practice, we shall be governed by the results of the experiments we have made here." In other words, he and his staff of experts have settled the whole matter on laboratory tests, and care nothing for what has been done in actual practice in Europe.

In conclusion, Senator, I trust that you will not think that I am asking your committee to decide a purely academic question or a technical dispute. Of course, I do not expect the committee to determine whether I am right or whether Mr. Parish is right.

The question, however, is not an academic one. If my claims are correct and my system of lubrication is adopted, the effects will be:

1. To lengthen the life of an aeroplane engine by probably 50 per cent, thereby in substance increasing the number of aeroplanes in service by 50 per cent.
2. To increase the power of the engine by from 10 to 25 per cent.
3. To reduce the amount of gasoline and oil consumed for a given amount of work. While this would result in a considerable saving of money, this is not so important as the fact that with the same amount of gasoline and oil the range of the aeroplane would be extended.
4. To increase the margin of safety for the aviator by preventing failure of lubrication and consequent breakdown of the engine.

As to myself, I would call your attention to the fact that I have contributed to the industries of the world two products of prime importance, carborundum, now in universal use as an abrasive, and artificial graphite, largely used in the form of electrodes for the production of various war materials, which it would be practically impossible to produce without them. Incidentally, I may say that the DuPont Co., since the present European war began, has ordered over 800,000 pounds of my graphite, to be used in the lubrication of rifles, and I have been informed that its use has increased the range of the rifles at least 20 per cent. You and your colleagues no doubt have been to Niagara Falls and may have seen something of the magnitude of the carborundum and graphite plants. Important as these two products are, it is my deliberate judgment that Oildag is more important to the world than either of them, because when it is in general use it will aid in the conservation of one of our most important natural resources, namely, petroleum, and at the same time extend the life and increase the efficiency of all kinds of machinery having moving parts.

If you deem this matter important enough to warrant investigation, I shall be glad to place myself at the disposal of your committee at any time, furnish you with such evidence as I have, and place in your possession information which, when followed up, will lead, I believe, to important disclosures.

Believing that this matter will be of interest to Members of Congress generally, I am taking the liberty of sending a copy of the pamphlet to each Senator and Representative.

Respectfully, yours,

EDWARD G. ACHESON.

P. S.—The pamphlet is sent you under separate cover.

JUNE 12, 1918.

EDWARD G. ACHESON, Esq.,
Acheson Corporation,
35 West Forty-second Street, New York, N. Y.

MY DEAR SIR: Your letter of the 6th instant, together with copy of pamphlet, was received yesterday. I have not had time to do more, up to the present writing, than to read the letter, which is most interesting.

As soon as our inspection of aircraft production plants is finished we expect to have a few hearings, and will offer you an opportunity of confronting Mr. Parish, or of making such statement to us as you desire. If you have any oil tests of your own. I am sure the committee will be glad to know of them.

I am to-day writing Mr. Parish and sending him a copy of your letter.

Yours, very truly,

WILBUR WRIGHT FIELD,
Fairfield, Ohio, February 28, 1918.

CHIEF SIGNAL OFFICER OF THE ARMY,
Washington:

Squier per Edgar re telegram February 8. Best price obtainable on grass seed for completing seeding of flying field is \$10,000. Estimate on labor to regrade field and seed \$15,000. Field in very bad condition, due to being under water for long time. Seed already planted apparently drowned. Many low places have developed, due to poor grading and flooding of field. This work should be started immediately. Will require about six weeks to complete. All arrangements for seed, labor, and machinery have been made. Request authority to proceed.

WILBOURN.

MARCH 6, 1918.

From: The Engineer Officer.

To: The Commanding Officer, Signal Corps Aviation School, Fairfield, Ohio.

Subject: Difficulties occasioned abandonment second unit.

Anticipating the abandoning of the second unit, March 15, the Engineer officer has made a study of the work of his different departments in an attempt to make arrangements by which the efficiency of the plant as, first, a double unit school; second, as a single unit school, will not be materially reduced.

2. During the past summer when the number of planes here was about that allowed to a single unit school, it was found that the aero repair shop was entirely inadequate for assembling, disassembling, and repairing airplanes, wings, etc., and therefore the garage was moved to the second unit and that building devoted to the disassembling and repairing of damaged planes, the building of the aero repair shop being used partially for the fabrication for the wooden parts necessary for such repairs and the reassembling and lining up of planes before they were again issued to the field. When the second unit is entirely abandoned, this garage building now used for disassembling shop will be unavailable and repairs to airplanes will be reduced beyond a point that is reasonable for even a single unit school.

3. The dope house in this unit has been severely criticized not only by the officers in charge but by every inspector or foreign officer to whose attention it has been called. as being, first, entirely too small; second, as being entirely inadequately heated. Frequent representations of the latter condition have been made to Washington with the request that it be ameliorated, but to date nothing has been done. It is quite impossible, with the present arrangement, to maintain a temperature sufficiently high, except in the hottest summer weather, to do doping and varnishing properly.

4. Another serious condition develops in regard to the maintenance department. In order to effect the repairs and alterations of the electric and sanitary installation of the plant, as well as the buildings, it is necessary to operate a small shop for plumbers, carpenters, painters, and electricians, with benches and tools incidental to their work, as well as to provide considerable storage space for pipe, tile, lumber of different sizes and sorts, as well as a stockroom in which may be kept and from which may be drawn as needed, all tools of various sorts and description. No provision for these shops has been made by the architect, and while it has been unsatisfactory to a degree, it has been possible to house them in otherwise unoccupied buildings in the second unit. It will be necessary now to provide them with proper facilities for their work.

5. The storage of the oil necessary for the motor transportation, as well as that used by the airplanes, is a matter that has never been decided by Washington. Early last fall a sketch of a desirable storage warehouse was sent to Washington and recom-

mended by the local constructing officer, but nothing has been done. Recently we have had information that there is to be a lubrication section of the equipment division who will handle this matter, as well as attend to rectifying and reclaiming used oils. It will be necessary that immediate action be taken in this matter on account of the abandonment of the second unit, if storage space for the oil is to be provided.

6. There has been no space found available for the storage and proper care of ordnance supplies of the different sorts required in training the men in the school, as well as for equipping the outgoing squadrons. As in the case of the repair shops, it has been possible to manage, but since shortly proper buildings must be provided this detail should be studied with the others.

7. During the past flying season it was practically impossible to secure propellers, therefore in order to maintain flying it was necessary to make extensive repairs to those we had. This work was done under great difficulties in the aero-repair shop, on account of the vibrations caused by the woodworking machinery therein located. The space for this purpose, with a solid floor of concrete or other material, having about 1,000 square feet, should be provided.

8. It is therefore recommended that—

(1) The building designated on the plans of the first unit for this school as the future aero-repair shop be erected immediately.

(2) That another building of the same general type be erected in close proximity thereto, with a division in it which would make it possible to dope and varnish in the end shut-off. The heating and ventilation of this section should be carefully considered by those who have had experience in that line.

(3) That a building of the same general type as that called the machine shop be erected for the maintenance department and that an ell be placed upon it to provide storage and shops for the ordnance officers and their armorers.

(4) That it be drawn to the attention of the engineering section of the aero division that the motor test and motor-repair shop has been, and is, entirely inadequate in size and facilities for the burden put upon it during the past flying season. That recommendations have been made frequently for an increase in size and that same should be effected upon the opening of the flying season.

9. Your attention is invited to the fact that in spite of several letters and numerous telegrams, nothing has yet been done concerning the buildings in which the artillery observation range is to be installed, nor the building for the proposed lubrication section of the equipment division, who are to handle all oils and greases of the school.

10. These details are brought to your attention for the reason that it seems practically impossible to get any action in Washington, and that unless the school makes a creditable record blame will be attached to the commanding and other officers concerned, and in order that such blame may be averted by seeing to it that the above information reaches the proper offices in Washington.

D. BUCKLEY,

First Lieutenant, Signal Reserve Corps, Aviation Section.

[First Indorsement.]

HEADQUARTERS SIGNAL CORPS, AVIATION SECTION,
Fairfield, Ohio, March 8, 1918.

TO CHIEF SIGNAL OFFICER OF THE ARMY,

Air Division, Executive Section, Washington, D. C.

1. Forwarded. The recommendations contained in the foregoing letter are concurred in by the commanding officer. Attention is particularly invited to the four recommendations of paragraph 8, and the necessity for prompt action thereon, in order that this school may operate efficiently and effectively during the coming flying season.

2. Attention is also invited to paragraph 9, re oil-storage house and miniature range building. During the past three months information has been furnished from time to time that these buildings are to be constructed. Orders were issued to the commanding officer during the month of January to proceed with the construction of the range and authority was given for the hiring of the necessary electricians, etc. However, when authority for the construction of the necessary buildings was asked, information was furnished that the construction division would handle this work and that plans and specifications for same had been furnished said division. To date, this work has not been started, and, consequently, it is believed that there will be no miniature range at this station when flying is resumed.

3. Attention is also invited to the following facts in regard to the flying field: At the present writing this field is a bog; a large sum was spent during the past year in seeding this field; it is not known just how much was spent in grading it. Apparently,

most of the seed planted has been drowned by the excessive amount of water that has stood upon and is standing on this field. As practically no provisions were made for draining this large area of low river land, numerous irregularities have developed during the winter, and each depression has become in effect a small lake. Realizing that some action had to be taken in this matter at the earliest practicable moment, after the frost was out of the ground, the commanding officer secured bids on the seed necessary for seeding the field, and made arrangements for securing the services of an experienced landscape man for grading the field and planting it. The cost was estimated at \$25,000. However, when authority to proceed was requested, together with request that the necessary allotment of funds be made, the commanding officer was informed that the construction division had funds and authority to perform this work. To date nothing has been done toward beginning the work. It should be started at once. If it is not started at once and carried to completion in the shortest possible time, flying will be seriously interfered with and retarded, as after each rain numerous large pools of water will remain on the field, and in dry weather the dust will be excessive.

4. All buildings at this station should be painted at once. The amount necessary for the accomplishment of this work will be quite large. It is not known who is charged with the inspection and acceptance of this post as such from the contractors, but it is assumed that the construction division will be charged with the same. The local representative of this division states that the contracts are so numerous and continuous that inspection and acceptance of the plant as a whole can not be made. None of it has, as yet, been accepted. Notwithstanding this fact, much Government money has already been spent in the maintenance of the buildings. In the above circumstances the commanding officer hesitates to spend post maintenance funds in the painting of buildings that have not yet been accepted by the Government. It is requested and recommended that the question of inspection and acceptance of buildings at this station be at once taken up and decided, and that the construction division be directed to repaint all buildings now at this station. This work should be started at once.

ARTHUR E. WILBOURN,
Major, Signal Corps, Commanding.

WILBUR WRIGHT FIELD,
Fairfield, Ohio, March 9, 1918.

CHIEF SIGNAL OFFICER OF THE ARMY,
635 F Street, Washington:

Air executive. Unless steps are taken to have grass seed planted in aviation field, Fairfield, Ohio, as requested by commanding officer in telegrams to Chief Signal Officer of the Army, Air Division, Flying Section, and Chief Signal Officer of the Army, Squier, per Edgar, February 28, it will be impossible to start flying at this field April 15. Only answer commanding officer has thus far received has been letter from Supply Division, in which it is stated that this will be taken care of by Supply Division. So far no action has been taken. Early action necessary.

ARNOLD.

WILBUR WRIGHT FIELD,
Fairfield, Ohio, March 9, 1918.

TO CHIEF SIGNAL OFFICER OF THE ARMY, Washington:

Buildings at Fairfield, Ohio, need painting badly and repairs have to be made continuously. Representative Supply Division, this place, states that these buildings have not as yet been accepted by the Government and that they still belong to the Dayton Lumber Co. Action necessary to straighten this matter out should be taken at once so that commanding officer could make the necessary repairs and have such painting as necessary done through the representative of the Supply Division.

ARNOLD.

WASHINGTON, D. C., March 12, 1918.

OFFICER IN CHARGE OF CONSTRUCTION,
Government Aviation Field, Dayton, Ohio:

Col. Arnold wires air division buildings Fairfield need paint badly. See that this is taken care of, using white cold-water paint.

SALTZMAN, Acting.
Per. EDGAR.

ENGINEERING SECTION, *March 15, 1918.*

From: Office of the Chief Signal Officer.

To: Commanding Officer, Wilbur Wright Field, Dayton, Ohio.

Subject: Difficulties occasioned by abandonment second unit.

1. Answering your complaint of March 8 relative to condition of flying field, lack of miniature range building, and need of painting buildings, this office has brought these matters to the attention of the construction division with the recommendation that prompt action be taken to ameliorate conditions complained of.

2. The designs of the standard oil-storage house have been completed and approved and is to be erected at all flying fields. This construction has been authorized and it will undoubtedly be completed in time for your active flying season. No definite promise of completion can be given.

3. An additional aero repair shop, with an ell for housing the woodworking machinery, has been authorized for your field. If the woodworking machinery is arranged as shown on drawing No. 5-2 in this ell, it will relieve considerable space now occupied by woodworking machinery in your present aero repair shop and you should have ample space for airplane repairs.

4. Relative to paragraph 3 of the letter of March 6 from your engineer officer regarding inadequate heating of dope shop, have recommended to construction division that this be investigated and such action taken as will correct this condition. The heating originally planned has not proven satisfactory at any of the northern schools. As for lack of capacity, this has been corrected at other schools by installing rigging consisting of canvas slings and ropes running over blocks as shown in accompanying photographs, so that wings can be hoisted clear of the benches while varnish and dope is drying or setting. Covered wings ready for doping may be hoisted out of the way. The use of these slings and an intelligent planning of work has been found to practically double the capacity of the dope shop. The scheme was first tried out at Mineola, where it provided the additional capacity needed.

5. Relative to your complaint in paragraph 4 regarding maintenance department, this has been provided with space in machine shop at all new schools. The blue print of drawing S-5 inclosed shows how the machinery in a single-unit school may be arranged to secure adequate space for maintenance work. The plans are for the plumbers and electricians to have space in the machine shop, while the carpenters are given a position in the new-style aero repair building where they can use a part near the ell in which the woodworking machinery is installed. This makes it possible for them to use this machinery in working up lumber.

6. It has been the experience of this office that it is not advisable to have too much stock in the various shops, so in the layout submitted on Drawing S-5 only enough room is provided in the plumber and electrician's shop for such supplies as are constantly needed. The other supplies should be kept track of and disbursed by the supply officer as needed.

7. As you are to have added facilities, such as an oil storage house and a new aero repair with additional space for woodworking machinery, the storage and care of ordnance supplies will be a problem that may be taken care of by the release of space now occupied when new buildings are erected.

8. Your complaint in paragraph 7 relative to difficulty in securing propellers in the past will not apply to the coming flying season, as this office is assured that an ample supply of propellers will be available for all schools.

9. In section 4 of paragraph 8 you complain of lack of facilities in motor test shop. It is not likely that the armorer's school will need any of the test stands erected for the second unit, so these should be available for your use in motor testing. We are writing Major Hobley asking if there are any buildings in the unit turned over to him for the armorer's school that he can spare for your use with a view of giving you additional facilities for motor repairs.

By direction of the Chief Signal Officer.

Major, Signal Corps.

[Extract.]

JANUARY 26, 1918.

To: Chief Signal Officer of the Army, Air Division, Training Section, Washington, D. C.

Subject: Troubles being experienced at this station.

8. *Maintenance.*—At this particular station, the question of maintenance occupies a peculiar status. The construction division has received orders to perform some of the duties in connection with maintenance. They have been endeavoring to per-

form these duties. In addition, the post commander is furnished funds for the maintenance of the post, which maintenance he is directly responsible for, and is supposed to carry out with the assistance of the post engineer officer. Much confusion has arisen at this field due to instructions from the air division, involving maintenance, being sent through agents of the construction division who are still at this post.

It is very difficult to ascertain who is charged with particular operations involving maintenance, the construction division, or the commanding officer. Funds and supplies have been furnished, both by the post and by the construction division, for post maintenance. The representatives of the construction division are in as much doubt as to who is charged with proper maintenance as is the commanding officer at this station.

ARTHUR E. WILBOURN,
Major, Signal Corps.

REAL ESTATE SECTION,
May 4, 1918.

From: Office Chief Signal Officer, Supply Division.

To: Commanding Officer, Wilbur Wright Field, Dayton, Ohio.

Subject: Renewal of lease.

1. In connection with the renewal of lease for property occupied by Wilbur Wright field, inclosed is a blue print showing outline of property.

2. It is desired that information covering the following questions be submitted to this division:

3. Is the area of field of sufficient size, or should additional land be acquired in order to get best results? Is there any land leased in connection with field that is not used and could be abandoned without detriment?

4. Give your opinion as to the desirability of the field, considering it from all angles—climatical, cross country, general flying conditions, available landing places, good roads, treatment of troops by citizens, etc.

5. It is requested that a prompt reply be made.

By direction of Col. Edgar.

JAMES S. HOLDEN,
Major, A. S. Sig. R. C.

MAY 29, 1918.

From: Engineer Officer.

To: Commanding Officer.

Subject: Attached print.

The attached blue print was made from tracing borrowed from the chief draftsman, conservancy district, on which is shown in the lower left-hand section, in pencil, the area surveyed as land unsuitable for flying field. The field boundaries are clearly marked, together with the boundaries of the conservancy district, with the acreage of each section.

2. Since the grading has been done the course of the stream leading from above Fairfield has been kept out of the field, under normal conditions. This stream would never enter the field except in case of flood, and would pursue a course through some part of the field, which would be very hard to indicate without a complete topographical survey of the field since the new grading has been done.

3. Total area of entire field, 2,245.2 acres; 657.7 acres swamp area of flying field unsuitable for landing; 980.72 acres, area suitable for landing; 1,638.42 acres is the total area of the flying field itself; 606.78 acres, area occupied by buildings.

O. P. McCORD, Captain, Signal Corps.

[First Indorsement.]

HEADQUARTERS SIGNAL CORPS, AVIATION SECTION,
Fairfield, Ohio, May 31, 1918.

To CHIEF SIGNAL OFFICER OF THE ARMY,

Supply Division, Real Estate Section, Washington, D. C.:

1. It is believed that the area of Wilbur Wright field is sufficient for the purposes for which it is being used. It was originally intended that this should be a double-unit flying field. During the past flying season it was used as such. During the early spring one unit was converted into an armorers' school; one-half of the buildings were considered necessary for this purpose, but the whole of the flying field is still available for flying instruction. Recently a testing department has been added

to this field for the purpose of making certain tests with battle planes. Some of the space has been given over to this work, but as it is believed that there will never be more than 10 or 12 planes undergoing test at this station at one time, it is thought that the space is amply sufficient for all needs. The land which is now in possession of the Government consists of 2,245.2 acres. Of this, 1,638.42 acres are in the flying field; 195 acres of the flying field are composed of marsh, which it has been found impracticable to drain; this land is indicated on the attached blue print by red line. It is recommended that this land be not leased again. It is recommended that the plot of land indicated on the attached blue print by green line be leased in place of the marsh area which has been recommended for elimination. It is also recommended that the supplementary fields be at once leased as per recommendations forwarded in first indorsement, this office, dated April 2, 1918, and letter, this office, dated April 15, 1918, copies attached.

2. *Climate*.—From about December 1 to about April 1 of the past year it was very cold, the average temperature being: December, 22°; January, 15°; February, 32°. A great deal of snow fell, the monthly fall for the period in question being: December, 13.7 inches; January, 34.4 inches; February, 0.4 inch; average daily fall, December, 0.4 inch; January, 0.8 inch. During that period this station was, of course, no good for use as a primary school. During part of this period it might have been possible to carry on advanced work at the station. However, such advanced work would have been seriously interfered with by the deep snow on the field which drifted a great deal. The depth of the snow on the field varied from 2 inches to 6 feet. During the spring there has been a very heavy rainfall. This has, of course, caused trouble and delay in instruction, due to the defects which will be discussed under surface and drainage.

3. *Surface and drainage*.—The flying field proper lies in the floor of the valley of the Mad River, and is approximately on a level with the river. Due to defects in grading and to the general geological formation of sand, gravel, and loam which covers this river bottom, the surface is very uneven, and it is very difficult and expensive to try to make it smooth and keep it so. While lack of smoothness is no detriment to flying in dry weather, it seriously interferes with flying after heavy rains. After such rains, and very frequently after a very light rain, the field has the appearance of a series of small lakes. The attached photographs marked "A" were taken at 7.45 a. m. on May 13, 1918. The rain which caused the condition indicated in these photographs fell on May 12. Although the weather was good for flying on May 13, it was impossible to use any part of the field other than a narrow strip in front of the hangars in the first, or north, unit on that date. On May 14 and 15 it was possible to conduct instruction work in country for instructions by using the strip in front of the hangars which has been referred to above. On May 16 instruction for cadets was resumed, but with many pools still existing on the field. On May 18 it was still not possible to use more than about half of the acreage in the flying field for landing. Of course, the loam where it shows above the water becomes very heavy, and although part of the field is in sod and the larger part of the remainder is being put into grass, a plane landing on it cuts very deeply; the mud is quite destructive of propellers and planes. Much time, labor, and money has been spent in an effort to grade this field. Apparently the question of drainage was not considered at all until after the grading had been completed. The attached photographs marked "B," taken about 3.20 p. m., May 12, show how the flying field in the second, or south, unit drains into the hangars of that unit. Photographs marked "C" show the general conditions in the vicinity of these hangars and on the flying field in front of them at about 7.30 a. m., May 13. It is admitted that this problem of drainage is a most difficult one when consideration is given to the fact that parts of the field are lower than the river level, but some more adequate provision should have been made than has been made. At the present time \$50,000 is being spent to care for drainage of the field. Efforts are being made to drain it by using French drains. It is not believed that drains of this type on the scale on which the allotment of \$50,000 will allow of their being constructed will ever take care of the drainage of the field after a moderately heavy rain. It is believed that the only method by which this field could be successfully drained would be to connect up all low places so that they will drain into one or two reservoirs on the field and then to pump the water from these reservoirs to the top of the hill on which the post is located and pipe it from there to the river.

4. *Cross-country*.—The field is well located for cross-country work. Good landing fields are available in every direction in a radius of about 60 miles.

5. *Roads*.—The roads within this reservation are on the way to being fairly good ones. Much time and labor has been devoted to them during the spring months, and within a few weeks they will be in excellent condition. The question of exterior roads has been fully discussed in communications forwarded from this office from time to time. Copies of this correspondence are attached hereto marked "D" Con-

ferences have recently been had with the State road commission on the subject of exterior roads. They are now repairing the detour road, which is indicated in the attached blue print in red. If these repairs are carried through, the road recommended in the attached communications marked "D" will not be necessary, but it is still believed that such a road on the reservation would be desirable.

6. There is and has been no complaint to make in regard to the treatment accorded to the troops of this command by the citizens of this vicinity.

ARTHUR E. WILBOURN,
Major, Signal Corps, Commanding.

WILBUR WRIGHT FIELD,
Fairfield, Ohio, June 8, 1918.

(Questions by Senator Reed; answers by Maj. H. C. K. Muhlenberg, Signal Corps.)

Q. What is your full name?—A. Henry C. K. Muhlenberg.

Q. How long have you been in the Army?—A. I entered West Point in 1904.

Q. What branch?—A. Infantry.

Q. Have you had any connection with flying?—A. I started flying in December, 1917.

Q. Been flying ever since?—A. Yes, sir.

Q. Practical flying?—A. Yes, sir; I have qualified as a J. M. A.

Q. Have you made a study of engineering outside of what you have learned in your Army experience?—A. I had four years service in the Ordnance Department, 1911 to 1915, during which time I was closely connected with machines of various types, but not particularly with gasoline engines. I had an automobile for two years from which I gained quite a little knowledge of gasoline motors.

Q. Have you ever used the Liberty motor?—A. I have flown the D. H. 4 plane.

Q. What other motors?—A. That and the Curtiss. Those are the only two types I have used.

Q. Did you ever use the Hispano-Suiza motor?—A. I have never used it. I like its appearance very much, and I would like to use it.

Q. Have you flown with the Liberty motor a good deal?—A. Only twice in a D. H. plane.

Q. In any other plane?—A. No, sir.

Q. What motor have you used principally?—A. The Curtiss in the Curtiss J. N. 4 machine.

Q. Have you conducted tests or been observer in any tests?—A. I have conducted what tests have been made of the Liberty engine, in the D. H. 4. We have tested two planes, both D. H.'s, one with a short radiator and one with a long radiator.

Q. When you make official tests with a D. H. 4 and Liberty motor, do you make them with what you would call a full war capacity?—A. With two loads. First, equipped as a bomber and as a fighter, the first as a bomber weighing about 4,000 pounds, and as a fighter, about 3,700 pounds.

Q. This chart that you have handed me is the official record showing the plane with equipment as a bomber and a fighter?—A. Yes, sir.

Q. Figuring it that way, you arrive at the conclusion that the weight per horsepower on this plane ready to fight is 9.45 pounds, and ready for a bomber is 10 pounds?—A. Yes, sir.

Q. How does that weight compare with the weight per horsepower of other machines?—A. I don't know.

Q. In arriving at the weight you charge the total load; that is, you charge the gasoline, the engine, and all that goes with it, and you charge the weight of the aviator also?—A. Yes, sir.

Q. Turning this chart into language it means at sea level the speed of both fighter and bomber is about the same, 122½ miles per hour; at 6,500 feet elevation the speed of the fighter is 117; the speed of the bomber is 112. There are two other lines which are "indicated speeds," which means that it is the speed that is indicated on the air-speed indicator, but the curves show the true speed as you have just given it?—A. The usual custom is to take the speed at 6,500 feet, 10,000 feet, and 15,000 feet. The speed at 10,000 feet for the fighter is 114, for the bomber 107, and at 15,000 feet the speeds are 107 for the fighter and 85 for the bomber.

Q. You did not get the readings higher than that?—A. No, sir; it is not customary.

Q. I am marking this "A." Will you be kind enough to attach a copy of this to the report when it is transcribed?—A. Yes, sir.

Q. How do these official tests compare with other machines?—A. They place it among the good machines, but not the best machine by any means.

Maj. HALLETT. In my opinion it is impossible to give an answer to that. Tests are made in various ways. My impression is that while these speeds are considerably lower than other machines, I should like to see the machines run neck and neck. There is room for a great deal of improvement in these speed tests.

Q. It is your opinion that these machines are as fast as other machines now used?—A. I doubt that, sir. They are built heavier; therefore I think they are not so fast as foreign machines. I think, however, that there is less difference in the actual speed of the machines than in the figures which are obtainable.

Q. Then they are slower than foreign machines?—A. I am afraid that they may be.

Q. In the tests you have conducted, how does the motor itself perform?

Maj. MUHLENBERG. I have complete reports on the condition of the motors in which it was found after being tested and the troubles experienced in the tests.

Q. Let's us have the last one first.—A. This report which you have handed me is the complete record from May 7 to May 29 and showing the troubles that you had with your machine. I will mark this "B" and ask you to please attach it on to this report. Now I will ask you a few questions about "B." I find here, for instance, that the radiator on May 18, radiator cap loose; radiator shutters closed. Now these troubles, were they sufficient to have caused the aviator to land?—A. Any altitude below 10,000 or 15,000 feet, the radiator shutters being closed, would have necessitated a landing.

Q. Now I am not going to take time, because I have not the time, but I notice on May 20, "motor went dead in the air." What is that likely to do to a man?—A. You notice "plugs right 3, left 4." The porcelain on these plugs were broken. The motor went dead because those plugs broke. The distributor collected oil which was forced through a felt washer and of course that killed the ignition, the motor went dead, and the machine was forced to land with the motor not running.

Q. That having happened on the field of battle might have been fatal?—A. Very easily.

Q. I notice you say here, "cleaned all plugs and drilled No. 52 hole in valve." Did that put this motor out of business again? I also notice "clean and put in new plug left 4."—A. The one plug had a cracked porcelain and probably caused the forced landing. In some cases those plugs would chip off so that the motor will continue to run and not do any harm.

Q. I see also "new battery installed." Was it damaged?—A. No; it was discharged.

Q. Notice next day, "water connection broken; motor overheated, L. 3, L. 1, and R. 6;" that means left plugs No. 3 and 1 and right plug No. 6 were broken. That would have been sufficient to have brought you down, wouldn't it?—A. Yes, sir.

Q. I see "needed new transmission, loose ends of wire nearly caused fire." What do you mean by this transmission?—A. The wireless apparatus for sending messages.

Q. Then it is not part of the motor?—A. No, sir.

Q. Now the motor overheated and I see that appeared several times. How much trouble do you have with overheating?—A. Equipped as a bomber or fighter the motor invariably overheats at 2,500 feet, which necessitates the pilot leveling off until she can cool so that he can finish his climb. This of course at wide-open throttle. This is due to the fact, however, that the engine is built for work at high altitudes. It is not designed to work at low altitudes.

Q. Yes; but is it not true that to gain the higher altitudes you must pass through the low altitudes, and shouldn't you be able to mount to these altitudes without leveling off to cool the motor?—A. Yes, sir; that is true.

Q. You have a lot of history of these flights held here, have you not?—A. Yes, sir; every one conducted here.

Q. And some of them have been cross country?—A. No, sir; we don't let the machine get away from the field. We don't like to take a chance should something go wrong with it.

Q. Who did you succeed?—A. No one, sir. Tests were not conducted here prior to my arrival.

Q. What is your opinion of the Liberty, in view of this performance? I will ask you frankly.—A. Of course, you will understand that I am not a motor expert. I would say that the motor is full of possibilities. It is really only in the experimental stage and is far from being perfected.

Q. You are having trouble with spark plugs?—A. The main cause for our spark-plug troubles can be laid to the hole, which you will notice, "drilled hole No. 52." We understand that the production machines are made with this hole. After we drilled this hole we experienced more trouble with spark plugs than we had before. It reduced our oil pressure from 35 pounds to 17 pounds. Then we put in a new valve without the hole and our spark-plug troubles lessened in a marked degree.

Q. Are you acquainted with the performance of the Spad machine?—A. Not intimately; no. Maj. Hallett can probably tell you about the comparative qualities of the two machines.

Q. Have you any suggestions to make looking to the improvement of either the airplane or the motor; and if so, will you please state them here.

WILBUR WRIGHT FIELD,
Fairfield, Ohio, June 8, 1918.

(Questions by Senator Reed; answers by Maj. Arthur E. Wilborn, Signal Corps.)

Q. Major, the committee has been looking over the Wilbur Wright field here where you are located, and I desire to ask you whether you have ever reported upon the condition of this field and, if so, to what office you have sent your reports?—

A. I have made several reports on the condition of the field by telegraph and by letter; some of them have gone to the Supply Division, some have been addressed to the Chief Signal Officer of the Army.

Q. In so far as you have copies, please attach copies, or have new copies made, together with any reports that you have received. I am asking you this, for the committee hasn't time to wait to examine all your reports. In that connection I desire to ask you whether the recommendations in the reports prepared of the field, of the erecting of buildings upon the field, was this construction work well done or not?—

A. I can say, in most respects, a very poor grade of workmanship and very poor material have been used.

Q. Have you reported that or are you intending to report it?—A. I have made reports, and I am intending to make a further report in my annual report which is now being prepared.

Q. Who will this report go to?—A. To the Chief of Air Service, Brig. Gen. Kenley.

Q. In view of the fact that your report goes to your superior officer before it reaches any one else, I will ask Gen. Kenley for a copy of this report. Do you know if there was any other aviation field available which would have been above the flood line?—

A. Yes, sir; I do.

Q. Where was that field located?—A. Near Medway, about 4 miles from this field.

Q. Have you ever rendered reports on that location?—A. Yes, sir; I have rendered reports on that field and have sent in a plot of the field, showing the acreage and the owners.

Q. Have you a copy of that report and plots?—A. Yes, sir.

Q. Could you make a copy of that report and plot a part of this report?—A. Yes, sir.

Q. In the work upon the Wright field have you had any trouble; any planes injured because of the unfit character of the ground?—A. We have had a good many planes that have from time to time nosed over, propellers broken and minor injuries which could probably be attributed to the wetness of the ground. We have had no serious accidents that could be attributed to the condition of the ground, but very frequently after rains we must stay off the field to prevent these occurrences.

Q. Have you any tabulation showing the amount of time lost on account of the field being low or swampy?—A. Yes, sir; we have copies.

Q. Will you attach copies of that?—A. Yes, sir.

Q. Are you familiar with McCook field?—A. I have been there two or three times.

Q. Did you ever fly there?—A. Yes, sir; I flew there once. I was the passenger and Maj. Gilkeson was the pilot.

Q. What happened to you?—A. Well, we hit along the edge of the field. Neither of us knew just how it happened. The field is rather small and we hit a tree.

Q. Is that field suitable for experimental flying?—A. No; it is too small.

Q. Is it surrounded by forests?—A. By trees of good size.

Q. As a matter of fact, are they not conducting a good many experiments on Wright field?—A. They are. A board has been appointed by the technical section at Wilbur Wright field.

Q. What is your opinion of the Spad machine with the Hispano-Suiza motor?—A. I would rather not give an opinion on the machine. I do not know enough about them. I have an opinion, of course, but I would rather have these technical fellows give you that.

Q. You say some planes that have been sent here for experiments were from McCook field. Was an Italian plane ever sent here?—A. There were three.

Q. What kind of machines were they?—A. Some time during the winter of 1918 I was called by Col. Vincent, of McCook field, and was asked if we had hangar space to set up two Italian planes. He stated that they did not have room to set up and test these planes and that he wanted to know if we could furnish space and men to

set them up. I told him we could do it. He telegraphed Washington and got authority to transfer these two planes out here. Some time later he called up and asked me to send trucks and men to haul the planes over to this station, which I did. The planes were brought here, two in a damaged condition. One of them, I think it was an S. V. A. plane with a Fiat motor, was damaged quite badly. The body of the fuselage was badly torn and the crank shaft bent. The other, a Pomillio with a Fiat motor, was in such a condition that we had to cover the fuselage in our shops. It never was discovered how they were damaged. I called Col. Vincent and wanted to know what to do about them. He said that the Italians would be out in a few days to fly them. I asked him how long they intended to keep them here, but he didn't seem to care anything about them. Later on some speed tests were conducted and representatives from McCook field were present. They came probably twice to watch the performance after the planes were set up.

Q. How did the planes perform?—A. They seemed to be a pretty good plane. I don't know the official figures on the speed of the S. V. A. I think they made something like 135 or 140 miles per hour. It was a very pretty machine and the pilot handled it very nicely. No one but the Italians ever flew it. The Pomillio was supposed to make around 130 miles per hour. I don't know whether they held speed tests on that or not.

Q. Did you understand that Col. Vincent wasn't taking any interest in that?—A. The conversation led me to believe that all he wanted to do was to let the Italians fly their machines here. It was as though the whole question had been settled before the tests.

Q. Mr. Vincent was one of the promoters of the Liberty motor; is that your understanding?—A. As I understand it, he was the chief engineer.

Q. When the motor was tested?—A. I have no definite information as to that, but I understand that he, as major in the Signal Corps, was the engineer in charge of conducting the tests of the motor.

Q. And, then, did he or did he not have a way of approving the motor or not in his official capacity?—A. I do not know, but I think he had. This is just my understanding.

Q. As a matter of fact, Major, do you feel that you are greatly handicapped by training these men on account of the moist, wet ground on which you are located?—A. I think so.

Q. How many officers are attached to these two units?—A. I think about 336 now.

Q. Are all of them quartered here at this post?—A. Yes, sir.

Q. Are they quartered in separate buildings—each officer have a room?—A. Each officer does have a room, but some officers are doubled up in quarters so that they have a set of quarters of two rooms, bathroom, and kitchen.

Q. Are the families of officers here, wives and children?—A. Yes, sir.

Q. Are these quarters furnished by the United States Government?—A. Yes, sir.

Q. Has that been the custom heretofore?—A. Yes, sir; it has in permanent stations.

Q. How are these quarters furnished?—A. Well, they are furnished with a rather expensive type of oak furniture, and in some instances with mahogany or walnut furniture, consisting of dining-room table, six dining-room chairs, library table and library chairs, and hatrack. I can't think of anything else. They don't furnish that type of furniture at other places.

Q. It is quite unusual, is it not?—A. It is furnished in a good many aviation schools.

Q. This is not supposed to be a permanent station, is it?—A. No; it is a war aviation school.

Q. You feel that the furniture furnished is of a rather expensive type?—A. Yes; for a station like this. For a permanent station it would be all right.

Q. You probably have \$20,000 worth of furniture?—A. Well, I couldn't answer that question intelligently without referring to our records.

TESTING DEPARTMENT,
WILBUR WRIGHT FIELD,
Fairfield, Ohio, June 10, 1918.

PROCEEDINGS OF THE BOARD AS CONVENED MAY 12, 1918, PER SPECIAL ORDER NO. 124,
HEADQUARTERS SIGNAL CORPS, AVIATION SECTION, WILBUR WRIGHT FIELD, FAIRFIELD,
OHIO.

HEADQUARTERS SIGNAL CORPS AVIATION SCHOOL,
WILBUR WRIGHT FIELD,
Fairfield, Ohio, May 9, 1918.

Special Order }
No. 124. }

[Extract.]

* * * * *

7. Under provisions of telegram from office Chief Signal Officer dated May 7, 1918, and telegram from office Chief Signal Officer dated May 9, 1918, a board of officers to consist of Maj. H. C. K. Muhlenberg, S. C.; Maj. William C. Ocker, S. C.; Maj. Albert S. Smith, S. C.; First Lieut. George D. Floyd, A. S. Sig. R. C.; First Lieut. Frank S. Patterson, A. S. Sig. R. C.; First Lieut. Lyman R. Ellis, A. S. Sig. R. C., is appointed to meet at Wilbur Wright Field, Fairfield, Ohio, at the call of the President of said board, for the purpose of conducting tests on the De Haviland Four and Bristol Fighter Airplanes.

* * * * *

By order of Maj. Wilbourn:

C. H. REEVES, Jr.,
Captain, A. S. Sig. R. C., Adjutant.

TESTING DEPARTMENT, WILBUR WRIGHT FIELD.
Fairfield, Ohio, May 12, 1918

The board met pursuant to the foregoing order this date at Wilbur Wright Field, Fairfield, Ohio. Present, all members. The board then proceeded to test the De Haviland 4 airplane, and met daily thereafter until the date of the communication of which this proceeding is an inclosure.

The plane tested, No. 32098, was of the very latest production type, and was flown to this field from the Dayton Wright factory immediately after having been given its flight tests by the factory, having been assembled but a few hours before. The plane was tested exactly as produced, except that brace wires were added from the elevator masts and rudder masts to the trailing edges of the elevators and rudder. (See photographs of the tail group of the machine.) In spite of the fact that this plane was reported to be a typical production plane, there are two points in respect to which it is not a production plane, namely:

(1) The oil pressure valve in which it is now the regular procedure to drill a bypass in order to reduce the oil pressure. This bypass has not been drilled in this ship; hence the somewhat high oil pressure of 35 pounds per square inch and the comparatively high rate of consumption of oil. The bypass mentioned was drilled as indicated below, but the reduction of oil pressure was so great that it was not deemed advisable to run the plane at that pressure, and an undrilled valve was inserted, leaving the motor in its original status as received from the factory.

(2) The crank shaft, which was the small size (2½ web) instead of the large size (3½ web). Motors of the latest type are supposed to have the large-size shaft.

This plane was received on May 17 and was promptly tested, as evidenced by the following summary of events in connection with the motor and the appended records of test.

May 17: Put on brace wires on elevators and rudders. Weighed machine. No flying.

May 18: Cleaned all plugs on motor. Radiator cap leaked. Radiator shutters closed; aneroids out of order. (2 hours 9 minutes.)

May 19: Greased wheels. No flying.

May 20: Plugs R3, L4 broke porcelain. Cleaned all plugs. Motor went dead in air; distributor oily and dirty. (3 hours 12 minutes.)

May 21: Cleaned all plugs. Put new felt in rear of distributor; drilled No. 52 holes in oil relief valve. Oil pressure 30 pounds. Plug L4 broke. Put in new battery. Absorber broke; shutter came loose. (2 hours 5 minutes.)

May 22: Water connections broke; motor overheated. L3, L2, L1, R6 plugs broke; put in new set of plugs. L4, L3 broke. Put propeller on radio generator. Short

circuit of wires, due to absence of transmission set, forced landing. Removed radio generator propeller. (33 minutes.)

May 23: Motor missing and overheated. Blew out hose connections. Gas line and carburetor dirty: charging generator out of order. Put in oil valve. New set of plugs. L1, L3, L6, rear, broke. Nose guides on bomb broke. Linen sewed on ribs upper and lower planes; patched hole in cowl. Greased wheels. (44 minutes.)

May 24: Motor working O. K. (23 minutes.)

May 25: Motor working O. K. (4 hours 24 minutes.)

May 26: Motor working O. K. Tire blew out left wheel, put on new one, it blew out rim on wheels. Straightened it out. (39 minutes.)

May 27: Motor working O. K. (1 hour 6 minutes.)

May 28: Motor working O. K. (4 hours 1 minute.)

May 29: Left for Mount Clemens, Mich.

In explanation of the above summary the following is added:

May 20: The motor went dead in the air due to the oily and dirty condition of the distributor, the oil having leaked into the distributor head through the felt washers surrounding the rocker-arm cam shaft.

May 21: The No. 52 holes drilled in the oil relief valve were drilled to make the motor a strictly production job, as it was understood that all motors now being turned out are drilled with these holes. It was found that in flying the oil pressure dropped from 35 to 15 pounds.

On May 22: On this date it should be noted that most of the trouble with spark plugs occurred.

May 23: A new oil valve without the holes in it was put into the motor and the old one with the No. 52 holes in it removed. The short circuit mentioned on May 22 was due to the fact that the leads which should have been inserted in the transmission radio set were loose and in some way caused a short circuit when the propeller of the radio generator on the landing gear was put in place. A fire was narrowly averted by the discovery of the short circuit by the observer and a landing was quickly made. The generator propeller was removed and left off. Attempts to obtain a radio transmission set have invariably resulted in failure. The receiving sets are obtainable but not the transmission sets.

May 23: The charging generator was out of order due to the armature burning out.

Special mention should be made of the notation under date of May 23 of "linen sewed on ribs of upper and lower plane." It has been found on both of the De Haviland Four planes tested by this board that the wing covering was much looser than is usual with other types of planes and that this looseness is due probably to improper doping and it causes undue vibration of the covering wherever the slip stream strikes it, resulting in the loosening of the covering from the ribs on the upper surface of the lower wings and the lower surface of the upper wings on both sides of and near the fuselage where the slip stream strikes the wings. It has been found absolutely necessary to reinforce and fasten the covering to the ribs in a number of cases and it is considered advisable to do it on all the ribs which are in the slip stream. In addition to the looseness of the covering itself the method of fastening or sewing the covering to the ribs is not as good as it might be, inasmuch as the sewing is done directly over the fabric without the reinforcing cap strip of the cloth between the wing covering and the thread. The reinforcements that have been put on by the board always consist of the cap strip first over which the sewing is done then another strip to cover the sewing itself. This is the best method of sewing the covering to the ribs.

On page 21, on the bottom of the page, is a notation to the effect that the air speed indicator was 3 per cent low and for lack of other information it was assumed 3 per cent low. Elsewhere, this was at 116 M. P. H. It is understood by the board that it is advisable for the sake of accuracy to calibrate the air speed indicator at the precise speeds at which it is used at high altitudes (6,500-10,000 and 15,000 feet), but the board also appreciates that the speed of the completion of the tests was also an important consideration. In view of this and also in view of the fact that foreign practice has found that the usual error is extrapolation instead of interpolation in arriving at speeds at high altitudes is so small as to be negligible, the board decided to turn in the results as obtained by extrapolation and to verify these results by more careful calibration of the air speed indicator and recorder at exactly the speeds which the instruments register at various altitudes.

REPORT ON WILBER WRIGHT FIELD TO SELFRIDGE FIELD FLIGHT AND RETURN.

The following is my report of the trip from Wilber Wright Field to Selfridge Field in the De Haviland Four No. 32098 with Maj. Smith as pilot.

Left Wilbur Wright Field at 10.13 a. m. May 29. Climbed to an average height of from six to nine thousand feet, flew north and arrived at Lake Erie over Sandusky,

then headed for Toledo and at 12.10 the oil supply was exhausted and a forced landing effected on a farm 6 miles east of Toledo. At 12.13 p. m. a new tube was inserted in left-hand wheel and broken plug in rear cylinder in left-hand block was replaced.

Started out at 3.20 p. m. for Selfridge Field, encountered low clouds as far as Detroit, when we ran into a rainstorm, then headed for Mount Clemens, Mich., and at 4.44 was forced to come down under clouds and fly at an altitude of about 200 feet to locate the field. After dropping several notes to a farmer asking the direction of the field found that the oil supply was nearly exhausted and made a forced landing on a farm near Richmond, Mich. Owing to the condition of the field, resulting from the continuous rain all the afternoon, the landing gear settled in the mud and the ship overturned very gently, having lost all its speed before overturning.

FROM SELFRIDGE FIELD TO WILBUR WRIGHT FIELD.

On June 1 left Selfridge Field at 12.12 p. m. and at an average height of about 7,000 feet flew to Toledo, landed on the golf course of the Toledo Yacht Club. Filled with oil, gas, and water and started at 3.39 p. m. for Wilbur Wright Field. At 4.48 landed on a farm at Wapakoneta, Ohio, and filled with gas, oil, and water and started for Wilbur Wright Field at 6.17 p. m. Landed at Wilbur Wright Field 6.50 p. m.

S. J. CREEN.

Photographs and descriptions of failures of parts of the machine or motor are appended to the last of the report. (See Appendix No. 7.)

A report by Maj. George E. A. Hallett on the condition of the Liberty motor used in this plane after 26½ hours running is appended herewith and marked "Appendix No. 6."

H. C. K. MUHLENBERG,
Major, Signal Corps, President of the Board.

WILLIAM C. OCKER,
Major, Signal Corps.

ALBERT S. SMITH,
Major, Signal Corps.

GEORGE D. FLOYD,
First Lieutenant, A. S. Sig. R. C.

LYMAN R. ELLIS,
First Lieutenant, A. S. Sig. R. C.

FRANK S. PATTERSON,
First Lieutenant, A. S. Sig. R. C.

[War Department, Air Service, Technical Section.]

WILBUR WRIGHT FIELD, OHIO,
_____, 19—.

OFFICIAL TEST OF DE HAVILAND AIR PLANE No. 32098.

Type 4, biplane, tractor; motors, one Liberty Twelve.

Equipment, bomber and fighter; propellers, one, Signal Corps, tractor.

Weight, empty, 2,448 pounds; weight per square foot, fighter, 7.3 pounds; bomber, 7.7 pounds.

Useful load, including pilot and observer, fuel and oil, 521 pounds, fighter, 813. or bomber, 1,032 pounds. Weight per horsepower, 9.45 or 10 pounds.

Total, with pilot and observer, fighter 370½–3,782, or bomber 4,001 pounds. Total weight on front wheels, 2,159 pounds.¹ Total weight on tail skid, 289 pounds.¹

Number of planes, two. Total weight on front wheels, 2,253 pounds.² Total weight on tail skid, 195 pounds.

Number of seats, two.

Crew, forward, pilot; aft, observer.

Number of controls, principal, 1; secondary, 1.

Elevator, unbalanced. Aileron, unbalanced. Rudder, balanced. Motor, manual.

¹ Tail skid on ground (bare plane).

² Plane in flying position (bare plane).

DESCRIPTION AND GENERAL CHARACTERISTICS.

Dimensions.—Span, 42 feet 7 inches. Total length, 29 feet 11 inches. Total height, 9 feet 8 inches. Height of hub of propeller above ground in flying position, 5 feet 4½ inches; at rest, 6 feet 5 inches.

Planes.—Type, R. A. F., No. 15. Sweepbacks, 0. Dihedral, 30. Stagger, 12 inches. Position of planes relative to fuselage, lower plane at bottom of fuselage; upper, 7 feet 2 inches above fuselage. Gap, 5 feet 6 inches. Total area including ailerons, 440.16 square feet.

Upper plane.—Span, 42 feet 7 inches. Cord, 5 feet 6 inches. Area, 225.8 square feet with ailerons. Incidence, 3°.

Lower plane.—Span, 40 feet 2 inches. Cord, 5 feet 6 inches. Area, 214.36 square feet with ailerons. Incidence, 3°.

Ailerons.—Number, 4. Arrangement, hinged on the far tips of upper and lower wings. Upper, length, 10 feet 10½ inches. Upper, chord, 19½ inches. Upper, area, 17.64 square feet. Lower, length, 10 feet 10½ inches. Lower, chord, 19½ inches. Lower, area, 17.64 square feet. Total effective area, 70.56 square feet. Distance from counter of ailerons to longitudinal axis of airplane, 15 feet 9½ inches.

Center section.—Dimensions, 45 inches by 29 inches. Area, 11.6 square feet. Contents, gas tank, nurse tank, etc., reserve gas tank.

Stabilizer.—Area, 38.42 square feet.

Elevator.—Area, 24 square feet. Distance from landing edge of elevator to c. b. of airplane, 18 feet 11 inches.

Fin.—Area, 6 square feet.

Rudder.—Area, 13.48 square feet. Distance from rudder hinge to c. b. of airplane, 18 feet 15 inches.

Fuselage.—Maximum cross section, shape, square. Maximum cross section, area, 8.04 square feet. Maximum cross section, dimensions, 35 inches by 28.625 inches.

Landing gear.—Number of wheels, 2. Tread, 6 feet. Shock-absorbing system, elastic cord. Braking device, none. Distance from c. b. to wheels, 19½ feet aft of axle.

Propeller.—Number of blades, 2. Diameter, 9 feet 2 inches. Pitch at 2 feet, 5.53 inches of center, 7.09 feet. Pitch at 3 feet, 3.37 inches of center, 6.95 feet. Pitch at 3 feet 12.21 inches of center, 7.67 feet. Width of blade at 2 feet 5.53 inches of center, 10½ feet. Width of blade at 3 feet 3.37 inches of center, 10⅞ feet. Width of blade at 3 feet 12.21 inches of center, 9½ feet.

POWER PLANT (CENTER).

Motors.—Make, Packard Liberty; factory number, 12040; Air Service number, 17722; cylinders, 12; horsepower, at 1,650 revolutions per minute, 360–410; weight, dry, 820 pounds; maximum revolutions per minute, 1,775; normal revolutions per minute, 1,750; propeller level flight, 1,750.

Ignition.—Battery or magneto, make, Delco battery; voltage and type, 8 volts; number, 2 complete sets; advance degrees, 30.

Starting arrangements.—Type, none.

Carburetors.—Make, Zenith; type, Duplex compensating; number, 2; sets, chokes, sizes, 31; main jet, size, 140; compensating jet, size, 150.

Radiators.—Make, Livingston long; type, honeycomb; number and position, 1 on nose; radiating surface, 59,100 square inches; length, 49½ inches; width, 28½ inches; core, 5 inches; frontal area, 816.4 square inches; water capacity, pounds, 74; manner of warming, shutters; water flow, gallons per minute, 100; head in inches, 3 or 4 inches; thermometers, number, 2; thermometers, make, Boyce; thermometers, type, motor-meter; free water area, 27.5 square inches; depth, free air area, weight, pounds, 112.

Mufflers (exhaust).—Number, manifolds; back pressure, inches of mercury, 2.

Oil tanks.—Capacity, pounds, 32; kind of oil, Mobile B; cooling area, cylindrical tank.

Sump.—Dry; capacity, pounds, 0.

Gasoline tanks.—Number, 2; position, one in center section, one in fuselage: capacity, main, pounds, 380; capacity, reserve, pounds, 45; feed system, main, pressure system; feed system, reserve, gravity; kind of metal and gauge (main), gauge 20 and 22; protective covering, none.

Oil pressure.—Minimum allowable, 40; maximum allowable, 20.

Motor controls.—Gas, shut-off cocks; spark control, manual; auxiliary, none; carburetor altitude adjustment, vacuum control.

SUMMARY.

[Ship No. 32098; large radiator.]

Fighter:

- 1. Endurance at 6,500 feet, full throttle, 1 hour 58 minutes.
- 2. Endurance at 6,500 feet, half throttle, 2 hours 38 minutes.
- 3. Ceiling, 19:700.
- 4. Climb to 10,000 feet (time), 13 minutes.
- 5. Speed at ground level, 120.6 miles per hour.
- 6. Speed at 6,500 feet, 118 miles per hour.
- 7. Speed at 10,000 feet, 114 miles per hour.
- 8. Speed at 15,000 feet, 107 mile per hour.
- 9. Weight, bare plane, 2,502 pounds.
- 10. Weight, loaded, 3,782 pounds.

Bomber:

- 1. Endurance at 6,500 feet, full throttle, 1 hour 48 minutes.
 - 2. Endurance at 6,500 feet, half throttle, 2 hours 27 minutes.
 - 3. Ceiling, 15,800 feet.
 - 4. Climb to 10,000 feet (time), 17 minutes.
 - 5. Speed at ground level, 117.3 miles per hour.
 - 6. Speed at 6,500 feet, 112 miles per hour.
 - 7. Speed at 10,000 feet, 107 miles per hour.
 - 8. Speed at 15,000 feet, 85 miles per hour.
 - 9. Weight, bar plane, 2,502 pounds.
 - 10. Weight, loaded, 4,001 pounds.
- Ship No. 32098 used Mobil B oil.

De Haviland 4, No. 32098, equipped as a fighter.

[Speed tests at all altitudes.]

Date.	True alti- tude, feet.	Indicated speed, miles per hour.	True speed, miles per hour.
May 18	2,460	117.5	120.6
21	7,770	105	117
21	10,780	96	113
21	15,740	83	106

De Haviland 4 plane, No. 32098, equipped as a bomber.

[Speed tests at all altitudes.]

Date.	True alti- tude.	Indicated air speed.	True air speed.
May 24	15,560	63	80
24	10,540	90	105
26	7,900	98	110
26	3,070	113.2	117.3

Armament and equipment.

	Fighter.			Bomber.			Reconnaissance.		
	Pilot.	Ob-server.	Weight.	Pilot.	Ob-server.	Weight.	Pilot.	Ob-server.	Weight.
Number of guns.....	2	2	97	2	2	97	2	2	97
Kind of guns.....	(1)	(2)	.....	(1)	(2)	.....	(1)	(2)	.....
Gun mounts.....	(8)	(4)	23	(8)	(4)	23	(8)	(4)	23
Ammunition, rounds.....	1,000	970	112	1,000	970	112	1,000	970	112
Bomb-dropping device.....				2		57			
Bombs.....				10		236			
Camera: Kind—made by East-man, Signal Corps, L Type.....									32
Drums, ammunition, for Lewis.....		10	24½		10	24½		10	24½
Plate holders.....								4	
Plate-holder magazine.....								4	6
Plates.....								24	
Radio set (receiving only on hand with generator, without propeller) ^a					1	18		1	18
Lighting system for night land-ing and heating apparatus.....	1		4½	1		4½	1		4½
Hygien apparatus.....	1	1	38						
Ring and bead sights, number.....	1		4	1		4	1		4
Teo-copic sights, make Aldis.....	1		5	1		5	1		5
Electrically heated clothing ^c	1	1	24						
Interphone.....	1	1	13	1	1	13	1	1	13
Imperis bomb sight.....					1	3			
Rev pistol.....	1		2½	1		2½	1		2½
Synchronizer.....	1		16½	1		16½	1		16½
Total.....			364½			616½			358½

¹ Marlin.
² Lewis.
³ Fixed.
⁴ Scarf.
^a The generator of the radio set, located on the landing gear and weighing 21 pounds was left in place in all tests. The propeller was not used, on account of inability to obtain a transmission radio set.
^c The electrically heated clothing, not being obtainable, was not used, the weight being supplied by the generator.

TESTING DEPARTMENT, WILBUR WRIGHT FIELD,
Fairfield, Ohio, June 11, 1918.

MEMORANDUM FOR COMMANDING OFFICER IN CONNECTION WITH SENATORIAL REPORT.

The following recommendations concerning the De Haviland 4-plane fitted with a Liberty motor are submitted by the testing department:

First. That the compass be located some place where it will not be affected by the ignition current, the joy stick, or the motor, such as on the longeron near the pilot's shoulder.

Second. That a joy stick of nonmagnetic material be used.

Third. That the gasoline tank be located directly behind the motor and directly over the center of gravity.

Fourth. That the De Haviland 4-plane be not used as a bomber on account of its limited load carrying capacity and limited fuel supply.

Fifth. That the gasoline and oil capacity be increased.

Sixth. That the motor oil be cooled by an oil radiator.

Seventh. That the water outlet manifolds be so arranged as to avoid the possibility of the formation of steam pockets, which now exist when the engine is in climbing position.

Eighth. That brace wires from the elevators and the rudder masts to the trailing edges of the elevators and rudder be added.

Ninth. That the carburetor be removed from its present location between the blocks and placed either behind the motor or on each side of the motor.

Tenth. That a gravity feed be used for the gasoline feed system instead of pressure feed as at present.

Eleventh. To locate the air intake of carburetors in such a way as to draw air from outside the hood and thus prevent fires under the hood due to possible backfiring.

Twelfth. That additional louvers be cut in the hood and the fuselage so constructed that the louvers can be put in the sides near the motor.

Thirteenth. That the radiator be set farther forward than at present to permit free passage of air.

Fourteenth. That an automatic cut-out be provided to prevent the burning out of the charging generator when the switches are turned on.

Fifteenth. That the wings be doped with a better quality material than is now being used.

Sixteenth. That the wing covering be fastened to the ribs in accordance with the best practice (two cap strips, one between the wing covering and the sewing and the other one on top of the sewing.)

H. C. K. MUHLENBERG.

This statement is made in the presence of Maj. Adlai H. Gilkeson, and is a condensation of the conversation the committee has had with him. Maj. Adlai H. Gilkeson, S. C., graduated from West Point in 1915. In 1916 he began flying. He used the Curtiss, Martin, Standard, Dayton-Wright, Standard, and the L. W. F., and in these planes there has been employed the Hall-Scott motor, the Thomas motor, the Curtiss, the Sturtevant, and the Hispano-Suiza motors. He has never flown with the Liberty motor, but has observed its action. In his opinion the Hispano-Suiza motor is a very superior motor, and at the present stages is better than the Liberty. The claim has been made for the Liberty motor by officers connected with the McCook field testing station that it would fly 138 miles per hour, but according to the actual test at the Wilbur Wright field, 126 miles per hour is the best they have been able to get out of the machine flying on level. It is the opinion of Maj. Gilkeson that in the present stage of development the Liberty motor is not as good as the Fiat. He states that complaints have been made that the spark plugs foul. One of the present difficulties with the motors seems to be overheating. In order to employ the Liberty motors which are in France to prevent overheating it is necessary to rise in a succession of steps, rising to a certain height, then flying on a level until he has cooled his motor, then proceeding in like manner until he reaches an altitude of 6,000 feet, at which point the motor will no longer heat on account of the lesser degree of atmospheric heat. If this is the case it is the opinion of Maj. Gilkeson that it is a very serious matter, because if an officer is to attack an enemy airplane, he does not want to have to take that long a time in reaching his altitude. It is proper to add, however, that Maj. Gilkeson does not know whether the radiation of the machines sent to Gen. Pershing have the same radiation as those which are being tested.

Questions by Senator Reed; answers by Lieut. Tabutau.

Q. Will you please tell us, Lieutenant, your connection with the French Army and your experience as a flyer.—A. I was with the French mission in Washington, and they sent me to Lake Charles to make some official tests.

Q. You are a lieutenant in the French Army?—A. Yes.

Q. You were a flyer in civilian life, and you began flying in 1909. You continued to follow your profession as a flyer, until the war, and then when the war broke out you went into the French Army as a flyer, a private, and now you are a lieutenant?—A. Yes.

Q. You have reached such a point of proficiency and skill in flying that the French authorities have sent you to this country to investigate the condition of our flying machines?—A. Yes, I have tried every machine in this country.

Q. The Government sent you to this country to try out various kinds of American machines, and you have tried out nearly all of them?—A. Yes.

Q. What machines have you tried, Lieutenant?—A. The Curtiss JN4 A, B, D, H; the Thomas-Gnome; Curtiss triplane; L. W. F.; the Thomas-Morse engine.

Q. Have you ever tried the Dayton-Wright?—A. No.

Q. Have you tried the Liberty motor?—A. Many times. At Lake Charles they gave me a plane to make some tests. I flew about 30 or 40 times.

Q. Did you have the Liberty engine there?—A. Yes.

Q. In what plane was this Liberty motor?—A. In the DH4.

Q. When were the tests made that you speak of on the Liberty engine?—A. Between the 20th of March and the 1st of May, 1918.

Q. Did you ever try more than one Liberty engine?—I have tried different motors, but always the same type of motor.

Q. What speed were you able to get out of the DH4 with the Liberty motor, fully equipped as a fighter?—A. I don't know just what speed. The only way to get the correct speed is to fly near the ground and take time by a watch over a speed course 2 or 3 miles. We found that the machine equipped as a fighter, with four machine guns, pilot, observer, and ammunition and two hours of fuel, the speed near the ground was 120.6; at 6,000 feet was 117 miles per hour; at 10,000 was 113; at 16,000 was

106 miles per per hour. The climbing speed was 10,000 feet in 13 minutes. That was for a DH4 fully loaded as a fighter. The same machine equipped for bombing, the speed near the ground was the same; the speed at 6,000 feet was 110 miles per hour; at 10,000, 105 miles per hour; at 15,000 feet, 80 miles. The climbing speed was 10,000 feet in 17 minutes.

Q. What day of the month was that?—A. It was during May. We took all those tests very carefully. I have seen machines at McCook field and south field, last October, 1917, but during those eight months they never made a test with weight in the machine, they have never loaded them. Even if your cooling system is right when you have no weight it is wrong when you have weight. The engine must climb without burning. I suppose when they say the speed is 130 miles per hour they are correct, but a plane must be loaded to get its correct and true speed. You must have an efficient cooling system. If you fly over into Germany at 10,000 feet and when you want to come back to France you run into some clouds, yet must go under the clouds. When you are down under the clouds if two or three Germans come along after you, you are going to open it up and let her go, notwithstanding the fact that Col. Hall said you should fly at 10,000 feet.

Q. In actual fighting what is the usual altitude of flight?—A. We fly at any altitude from the ground to 16,000 feet. At most altitudes one must fly for long periods with the motor wide open.

Q. What other work have you done with the Liberty motor aside from the work with the Liberty in the DH4?—A. At Lake Charles we have been conducting experiments with the cooling system.

Q. These were the latest types of Liberty motors?—A. Yes.

Q. The latest improved radiation?—A. Yes. This radiator was made for a 500-horsepower engine, but notwithstanding the size of the radiator the Liberty motor overheats.

Q. In ascending with the Liberty motor have you had this experience of climbing in successive steps to cool it off?—A. You must do that with the Liberty; yes.

Q. Have you had any trouble with the spark plugs?—A. Yes, some. I have broken two or three at Lake Charles and they said, "Oh, we will fix that in a few minutes." But how would we fix that if it were to happen in Germany? The cooling system is the only thing. The machine is a good machine if we could get a good cooling system.

Q. You use the Centigrade system of determining heat. According to that system water boils at 100 degrees. You must not boil your water in a flying machine. Any degree below boiling is tolerable. Now, if the difference between the external temperature and 100 degrees represents the amount of heat that must be absorbed by the radiator, so that if the temperature at boiling is 100 degrees and the external temperature is 22 degrees, then if you go above 78 degrees you have passed the danger mark?—A. Yes.

Q. You say you have tried the Le Pere. That there is a cooling system that is equivalent to 70 degrees Centigrade. Comparing that with the DH equipped with Liberty motor, the temperature is that is good for only 83 degrees, so that after the temperature has been raised 17 degrees it will boil, and in machines designed for use at the front we ask for 65 degrees and that any machine that does not come up to that standard we regard as not fit for fighting service. The Liberty motor, in other words, has a lack of 18 degrees Centigrade of cooling capacity?—A. Yes.

Q. That, you think, is the principal trouble with the engine?—A. The gasoline consumption is too high, which means that you must carry extra weight in order to cover the necessary distance. Endurance tests in the DH4, loaded as a fighter, with pilot, observer, machine gun, and ammunition is only 1 hour and 58 minutes.

Q. Does not that too depend upon the speed at which you fly?—A. In an endurance test we keep the throttle wide open. As a bomber the time has been 1 hour and 48 minutes.

Q. If you take 30 minutes to climb to the necessary altitude, it is not enough time to make a bombardment.

Q. But after all, the Liberty engine isn't so bad as you first thought it?—A. No; it is a good motor.

Q. You think then that the cooling system can be remedied and that the spark plugs and fuel system can also be remedied?—A. Yes; very easily. There is just one thing that can not be remedied in a motor and that is vibration and the Liberty motor is very free from that.

Q. What is necessary now is for the engineers not to be too proud and to say that they have a perfect engine, when it is still imperfect. —A. Yes; they should not stop and talk now. They should work hard. Try every conceivable experiment. Don't come out in the newspaper and say that the Liberty motor is the best motor in the world and quit work. Now is the time to work and work hard on perfecting a motor. In France we spend a year in tuning a motor up.

Q. If this is all correct will it not be a slow engine.—A. No; it is a good engine.

Q. Do you know of a better engine than the Liberty?—A. No; of course, some of them are better tuned than the Liberty.

Q. What do you think of the Delco ignition system?—A. I like the Delco ignition system. It is very easy to start. Myself, I have never had any trouble with the Delco ignition.

Q. Then the greatest difficulty with the Liberty engine is the radiation?—A. Yes.

Q. Have you ever had any broken water jackets, or cylinders?—A. No.

Q. Have you had any trouble with the oil sump?—A. No; of course, you have to clean it off very often.

Q. Have you ever had any broken off?—A. No.

Q. Do you think that it would be better to have them secured with a bolt?—A. That I believe is too trivial to consider.

Q. How about the suggestion of using brass tubing instead of honeycomb radiators?—A. The trouble is not in the radiator but it is the cooling system. The cooling system includes the radiator, the water pipes, the water jackets, and water pump, and the flow of air through the radiator, all that is the cooling system. My personal opinion is in the flow of the air through the radiator. At Lake Charles we took five air speed meters and put them inside the radiator and at a speed of 65 miles per hour we found that air was passing through the radiator at only 45 miles per hour. There doesn't seem to be sufficient ventilation. The air seems to be trapped after it gets past the radiator, and there is no way for it to get out after entering.

Q. Have you any other criticisms to make?—A. Well, it is bad to open the air intake inside the cowl, for in case of a back fire the aviator would be burned. I told Col. Hall about this, and he said, "Well we haven't burned up any yet"; but why should we wait until some man is burned and then change it. In France there is a law forbidding the opening of an air intake inside the cowl.

Q. Then the lieutenant thinks that the trouble is not in the radiator but in the cooling system, and he thinks that experiments ought to be conducted of every conceivable kind and that the engineers should not assume that they have a perfect machine and have not.

AUXILIARY FLYING FIELD.

CHIEF SIGNAL OFFICER OF THE ARMY,
Air Division, Flying Section, Washington, D. C.

In compliance with letter, Air Division, Flying Section, dated February 15, 1918, the following described property is recommended for purchase or for lease as an auxiliary flying field. It is recommended that action be at once had upon the recommendation in order that the land may be cleared, graded, and seeded with the least practicable delay.

2. This land is located in the State of Ohio, county of Clark, and is adjacent to the town of Medway. The accompanying map shows the location of this property with respect to the Wilbur Wright Field at Fairfield, and gives a fairly good idea of the topography of the surrounding country.

3. This property is approximately 4 miles from the present flying field and is easily accessible. The tracks of the Ohio Electric Railway pass along the eastern extremity of this property and one good improved road leads to it via Osborn. This road is shown in red on the map.

4. The land is almost level, sloping gently from north to south, and the natural drainage is good. The surface will require little grading. A great portion of it is already in grass.

5. The cost of razing all buildings, grading, and planting entire field with grass is estimated at \$15,000.

6. The attached map of the proposed field shows the size and shape of each plot with owner's name. The plots are numbered and will be referred to below by number

Owner.	Address.	Plot No.	Acreage.
Howard Gerlough.....	Medway.....	1	153.65
Michael Styer.....	.....do.....	2	17.22
Springfield & Western Electric R. R.....	Care Ohio Electric Ry., Medway.	3	128.85
Paul Warner.....	Medway.....	4	115.00
Ella Gerlough.....	.....do.....	5	105.42
Maria Weinland.....	.....do.....	6	155.00
F. Hale.....	.....do.....	7	45.85
F. C. Dille.....	.....do.....	8	25.00
Total.....	.....		745.97

7. The question of purchase and lease price of this land has been taken up as quietly as possible in order to keep the cost as low as possible. Definite prices can not now be furnished, but it is believed that all of this land can be purchased at an average of \$200 per acre. As soon as definite figures have been obtained, they will be furnished, but attention is invited to the fact that first figures may be considerably increased after the owners have had time to consider. It is therefore recommended that this land be purchased at once.

8. This is the very best land in the vicinity of this field for the purpose of which it is desired. In fact, it is the only land that can be found in the desired acreage that can be used as a landing field almost immediately. The principal operations necessary to put this field in commission are the removal of buildings and the planting of part of it. The grading necessary will hardly be greater than that necessary in the present flying field.

Major, Signal Corps.

A true copy.

C. H. REEVES, Jr.,
Captain, Signal Corps, Adjutant.

MARCH 26, 1918.

From: Chief Signal Officer of the Army.

To: Commanding Officer, Wilbur Wright Field, Fairfield, Ohio.

Subject: Auxiliary flying fields.

1. Your letter of March 10 shows that you misinterpreted our letter of February 15 regarding auxiliary fields. It is not the desire of this office to build another unit school at Fairfield, Ohio, and therefore no such proposition as 745 acres will be considered.

2. On account of the congestion of planes at the present fields, and in order to increase production of trained pilots, it has been found approximately 100-125 acres each. This has been necessitated by giving the flying schools more specialized work, and it is planned that these fields shall be used by the more advanced classes, such as stunt flying, formation flying, etc., so that they can be entirely separated from the main field and the cadets undergoing their primary training.

3. You will therefore submit a report on the selection of three auxiliary flying fields. If more than three are suggested, state which three you have preference for, each of these fields to be approximately 100-125 acres. You will give the approximate purchase price, rental price, suitability, and distance from the main flying field, the accessibility, names and addresses of the owners, necessary cost of proper surfacing, etc. You will send this report in to the Air Division, Flying Section, as soon as possible.

By direction of the Chief Signal Officer:

First Lieutenant, Sig. R. C. A. S.

A true copy.

C. H. REEVES, Jr.,
Captain, A. S. S. R. C., Adjutant.

[First Indorsement.]

HEADQUARTERS S. C. A. S.,
Fairfield, Ohio, April 2, 1918.

To: Chief Signal Officer of the Army, Air Division, Flying Section, Washington, D. C.

1. Returned. The instructions contained in letter of February 15 were not misinterpreted in this office, as it was not understood that another unit school was to be constructed at Fairfield. The tract of 745 acres was selected in order that there might be some real relief at this field should crowded conditions prevail. Since information has been furnished that this is to be a primary school it was not deemed advisable or safe to lease or purchase tracts of land of an area much less than 700 acres, if such were to be used by beginners in order to relieve congested conditions in the air. It is still believed that it would be to the best interests of all concerned if the tract of 745 acres should be leased or purchased, and it is so recommended.

2. In compliance with paragraph 3, the following tracts are reported as complying as nearly as possible with the requirements as set forth in paragraph 2:

(a) Acres, 160. Purchase price, \$185 per acre. Guaranty on stock, crops, etc., \$5,500. Rental price: Will not rent. Suitable in so far as surface, drainage, etc., concerned. Distance from the main flying field, 4 miles. Easily accessible, good

improved road, and trolley leading from main field to this field. Name of owner, Maria Weinland. Address, Springfield, Ohio. Approximate cost of proper surfacing, ———. This property is a part of the tract of 745 acres referred to above.

(b) Acres, 207. Purchase price, \$200 per acre. Rental price, \$5,000 per year for three years. Suitable in so far as surface, drainage, etc., concerned. Distance from main flying field, 4 miles. Distance from field described under (a), 3 miles. Easily accessible, good improved road, and trolley leading from main field to this field. Name of owner, Mr. John Warren Kesler. Address, Dayton, Ohio, Route 1. If immediate possession desired must be taken up with Mr. Bardgill, the present tenant, whose address is New Carlisle, Ohio, Route 1. Approximate cost of proper surfacing, \$5,000.

3. Efforts are now being made to locate and obtain data on a third tract that will as nearly as possible comply with specifications of paragraph 2. As soon as such tract has been located and data obtained, same will be forwarded. In this connection it may be stated that it is very difficult to secure land of the desired topography of an acreage of from 100 to 125 in this vicinity without purchasing parts of at least two farms. This is very difficult, as each owner wants to sell all or none. The two tracts described above are as near the specifications in size, other things being considered, as can be found. Attention is also invited to the fact that it is difficult to secure short-time leases on land in this vicinity. The owner of tract (a) states that he will not lease at all.

ARTHUR E. WILBOURN,
Major, Signal Corps, Commanding.

A true copy.

C. H. REEVES, Jr.,
Captain, A. S. S. R. C., Adjutant.

ADJOINING FIELDS.

APRIL 1, 1918.

COMMANDING OFFICER,

Wilbur Wright Field, Fairfield, Ohio:

Following your verbal instructions on this subject you are advised that in the lot spoken of in your letter of March 10 there is 160 acres in about the center of the plot as shown in the blue-print map forwarded with your letter, with notation that is available and suitable. It is, as you stated in your original letter, about 6 miles distant in an air line from this field and is easily accessible by motor over good roads. It is not far from the lines of the Ohio Electric which pass through Medway, and as some of the adjoining farms are the property of said railway it is likely that a switch could be run into the area.

2. The owner of this property does not wish to rent it under any consideration whatever, but he is willing to sell it for \$185 an acre, which price, it is believed by the writer, could be reduced by possibly \$5 an acre if immediate cash could be secured. The owner further wishes that a certain percentage of the value of the crops, stock, etc., amounting in all to \$6,500, be guaranteed to him, as was done by the Dayton Conservancy Board when they took over the property upon which this school is located. He has some wheat planted, the value of which is estimated at approximately \$800. The post-office address of the owner of this farm is Springfield, Ohio.

3. The ground is approximately flat and there would be little or no cost of grading. It is believed that \$5,000 would probably cover the cost of removing the fences, buildings, and so forth.

4. There is another field about the same distance from the school, but about 3 miles east of Medway, upon which there is a suitable flat area. The property is owned by Mr. John Warren Kesler, whose post-office address is Dayton, Route 1. It contains 207 acres. The eastern portion of this farm has a stream running through it, which causes a slight depression in the ground, but by securing 50 acres of the property owned by Mr. Grimes, whose post-office address is New Carlisle, Route 1, a field of the desired dimensions is easily procurable.

5. Mr. Grimes has not been interviewed personally, but Mr. Kesler wishes \$5,000 per annum rental for his farm for three years, and asks \$200 per acre for the farm. It is believed that a smaller figure would be satisfactory if properly presented to him.

6. This farm is occupied by a tenant, a Mr. Bardgill, whose post-office address is New Carlisle, Route 1, and with whom arrangements must be made if immediate possession is required, it being leased from March 1 to March 1 by him. He has been interviewed and is willing to sell his lease at a reasonable figure.

7. This farm is approached by stone roads and the Dayton-Springfield branch of the Ohio Electric passes but a few rods to the north. If the property owned by

Mr. Grimes is purchased a direct inlet for a switch would be afforded. The bulk of both of these farms is in grass, and it is believed that \$5,000 would probably cover the cost of removing the fences, buildings, and so forth, required.

8. You are advised that prompt action by the authorities in Washington will result in a great saving to the Government, since the planting season is already started and will soon be in full operation and that the damages demanded by both owners and tenants are now mounting daily.

D. BUCKLEY,
Captain, A. S., Sig. R. C.

A true copy.

C. H. REEVES, Jr.,
Captain, A. S., Sig. R. C., Adjutant.

APRIL 15, 1918.

AUXILIARY FIELDS.

CHIEF SIGNAL OFFICER OF THE ARMY,
Air Division, Flying Section, Washington.

Reference letter, Flying Section, March 26, 1918, in regard to auxiliary fields and indorsement thereto from this office dated April 2, 1918, the following report is rendered on a third field, which complies as nearly as possible with the requirements as set forth in letter:

Acres, 125. Purchase price, \$300 per acre. Rental price: Will not rent. Suitable in so far as surface, drainage, etc., concerned. Distance from main flying field, 3 miles. Easily accessible, good road and trolley leading from main field to this field. Name of owner, The Harshman Improvement Co., Dayton, Ohio. Address, R. R. No. 17. Approximate cost proper surfacing, \$5,000.

ARTHUR E. WILBOURN,
Major, Signal Corps.

A true copy.

C. H. REEVES, Jr.,
Captain, A. S. S. R. C., Adjutant.

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
Washington, May 24, 1918.

From: Office Director of Military Aeronautics.
To: Commanding Officer, Wilbur Wright Field, Fairfield, Ohio.
Subject: Auxiliary fields.

1. You are directed to advise this office, as soon as possible, as to what additional facilities, if any, in the way of telephone and telegraph lines, gasoline equipment, water supply, etc., will be required in the maintenance of auxiliary fields at you, school.

By direction of the Director of Military Aeronautics.

JOHN F. CURRY,
Lieutenant Colonel, Signal Corps.

[First Indorsement.]

HEADQUARTERS, S. C. A. S.,
Fairfield, Ohio, May 28, 1918.

To: Director of Military Aeronautics, Washington, D. C.

1. Three fields in the vicinity of this station have been selected, and recommendation has been forwarded in the Supply Division that they be leased as auxiliary fields. No action is known to have been taken on this recommendation. If the fields referred to are leased, any additional facilities of the nature indicated in above letter can be easily furnished at little cost of post funds, work being accomplished by the maintenance department.

ARTHUR E. WILBOURN,
Major, Signal Corps, Commanding.

A true copy.

C. H. REEVES, Jr.,
Captain, A. S. S. R. C., Adjutant.

TESTING DEPARTMENT.

Questions by Senator Reed; answers by Mr. Acosta.

Q. What is your connection with the engineering department?—A. I am assisting in making tests at this field.

Q. What experience have you had in aviation?—A. I have had nine years experience as a flyer.

Q. What machines have you used?—A. I have flown about every machine made in this country and some made abroad.

Q. Have you ever used the Liberty motor?—A. Yes, sir.

Q. In what machines?—A. In the D. H. 4 and the Bristol Fighter.

Q. What other motors have you used?—A. Curtiss, Hall-Scott, Hispano-Suiza, Sturtevant, Thomas Morse.

Q. What are your criticisms of the Liberty?—A. I agree with the lieutenant in all his criticisms. They are all of them very true. But too much has been expected of the D. H. 4. He has asked the question, "Would the D. H. 4 make a successful bomber?" I say that a D. H. 4 has no business over in Germany as a bomber.

Q. Why?—A. Because the machine is built principally for a fighter. We are building a machine for one purpose and trying to make it serve a tenfold purpose. A larger and heavier machine and with multiple motors should be used. The great damage intended to be accomplished by a bomber can never be accomplished with a D. H. 4 type of machine.

Q. Of course, the entire air program does not consist of D. H. 4's. They are putting Liberty motors in Capronis and Handley-Pages.—A. Yes, sir. The thing you need for a bomber is a multiple-motored plane.

Q. What machine then will be adapted for bombing?—A. They will have to arrive at that conclusion.

Q. We understand that there are certain limitations to the D. H. 4, consequently there are limitations to the engine in that kind of machine; but is the D. H. 4 with the Liberty engine adapted for any kind of military purposes?—A. Yes; for patrol work.

Q. Some criticism has been made that the plane will only have fuel capacity for two hours of flight.—A. Yes; after we get better fuel consumption, a lower consumption, we might get better results.

Q. Lieut. Tabutau, how long should a patrol machine be able to fly?—A. Three hours.

Q. Will changing the cooling system solve that?—A. It certainly would.

Q. If that is correct it will probably be a good motor.—A. I do not think it proper to expect too much of the D. H. 4.

Q. What have you to say about the Bristol Fighter?—A. My experience has not been extensive enough to give any comparison. That is a fair comparison.

Q. Lieut. Tabutau, what is your opinion of the Bristol Fighter?—A. I have no opinion.

Q. What do you think of the Spad as an effective machine for us to build?—A. Mr. Acosta, well, for its purpose it is a very good machine.

Q. Lieut. Tabutau, what is your opinion of the D. H. 4 as a combat fighting plane?—A. Not very good, because the pilot is too far from the observer.

Q. The Le Pere machine that you remember is very much like a similar one that is being constructed.—A. Yes; it is here at this field.

Q. Do you think it may make an effective high-class machine?—A. It may; yes.

Q. Lieut. Tabutau, what is your opinion of the Spad?—A. It is a very good machine, but you Americans seem to be prejudiced against a one-seater machine.

Q. Mr. Acosta, what is your opinion of the Spad machine?—A. It is very fine for a combat plane.

Q. What is the radius of flight for these bombing machines?—A. Day bombing, between three and five hours; night bombing, ordinarily five hours.

Q. You can fly five hours?—A. Yes; those are slower machines.

Q. What is the mileage range?—A. A little more than 100 miles each way.

Q. Do you think by bringing the pilot closer to the observer that it will increase the machine much as a combat plane?—A. Yes; if that change is made it will undoubtedly make it more effective.

Q. Lieut. Tabutau, have you any suggestions to offer?—A. I would suggest that the experiments be made in the air and not on the ground. We do not want to perfect the machine for ground work. We must use it for air.

Q. What other bombing plane do the French use?—A. The Brigada.

Q. Lieut. Tabutau, do you know about the selecting of this field for an aviation school?—A. Yes; last July, or rather the latter part of June, I was a member of the

French commission when they visited Dayton in company with Gen. Squier, Lieut. Boyregnes, and Col. Edgar.

Q. Did you advise them that this was not a proper place for an aviation school?—A. Yes; because it was in a valley.

Q. Was the selection of this field made by Signal Corps officers?—A. I think Col. Edgar was a member of the committee, but I don't know who selected this site.

Answers by Maj. George E. A. Hallett.

Q. Are you a West Pointer or are you from civil life?—A. From civil life.

Q. When does your commission date?—A. May 18, 1918.

Q. Have you had any connection with the Aviation Service prior to that date?—A. I have been an aeronautical mechanical engineer since 1914 for the War Department.

Q. What were your duties there?—A. I was in charge of motor experiments at San Diego and of all motors on the field. I then took charge of the training of all regular officers of the line who took training in flying. I then took charge of the training of enlisted mechanics and was called to Washington and established five schools at the northern fields, including this one. When flying was resumed I assisted in the organization of two large schools for the training of mechanics. About the 14th of May I arrived at this field and have been assistant to Maj. Muhlenberg in the testing department.

Q. You are not a flyer yourself?—A. I have been in aviation work since 1909, and spent a year in Europe. I flew a little in 1914, but haven't flown much since.

Q. Are you a graduate of any engineering school?—A. No, sir.

Q. Have you followed it practically?—A. Yes, sir.

Q. You have been in Europe and in this country observing the performance of every standard machine?—A. Yes, sir.

Q. Not only in Europe but also in this country?—A. I was in Europe in 1913.

Q. And you have seen some of the latest type European planes that have been sent here. You have seen nearly all that have been sent here?—A. Yes, sir.

Q. What is your opinion of the Liberty motor? I hope you men will answer these questions from your heart. This may mean a good many lives and may be empires.—

A. Sir, I have made a study of motors and tests of motors, and I believe that I am able to give a fair idea of it. It is rather a complicated situation. I can say this, that the parts of the Liberty motors that I have dismantled after having been flown have been in excellent condition. I like the motor very much. Now, on the other hand, the Liberty motor has never had a fair chance, because it has not been cooled properly in the D. H. 4 machine. I have made reports concerning this overheating and have suggested remedies.

Q. Who did you make that report to?—A. To the enlisted mechanics' section of the Signal Corps.

Q. Those reports found their way to?—A. They found their way to Col. Bane.

Q. In a general way what were the recommendations?—A. I suggested that additional openings should be made to let the air escape; that the radiator should be set farther in front of the motor so as not to obstruct the free passage of the air through the radiator and probably that a larger radiator would be necessary. I think that is all I recommended at that time. At present I can say that it is very difficult to cool the motor, apparently the most difficult in the low altitudes. This is due, of course, I think to the high compression of the motor. This high compression causes preignition. Where the ignition would take place 30° before top center, this overheating may ignite the gases 60° before top center.

Q. That might be remedied by a slower burning fuel?—A. It would not be practicable to remedy it that way.

Q. If fuel was developed, a slower-burning fuel, might that not be a probable remedy?—A. A slower-burning fuel might burn the exhaust valves.

Q. Have you any suggestions to offer looking to the improvement of the motor?—A. I haven't now, but I think I will be able to discover some in a few days. It is my belief that steam bubbles form in the different water circuits.

Q. What do you say about the effect of putting the carburetor in this place?—A. I think it is desirable.

Q. I have a rough drawing here that Lieut. Tabutaut made with the suggestion that the carburetor be removed from its present location now between the cylinders to below or under the cylinders, giving a longer pipe connection. Would that be an improvement?—A. I believe that would be a good improvement.

Q. If I get you right then, this is a good motor?—A. Yes; but the distributor point is not right, the carburetor is not right and the cooling system must be improved.

Q. What do you think of the D. H. 4 as a fighting machine on the front?—A. It is my impression that the machine would make a good account for itself on the front.

Q. What is your opinion of it as a bomber?—A. I am not very enthusiastic about it.

Q. What have you to say of the weight of the Liberty motor compared with the weight of other machines when you charge to each machine the weight of the gasoline which must be carried?—A. I think it is about the same as the English Rolls-Royce.

Q. Which uses the most gasoline, the Liberty D. H. 4 or the Rolls-Royce D. H. 4?—A. The Liberty would use more gasoline.

Q. Then it would have to carry more gasoline to get the same number hours of flight as the other machine, which would also increase its weight in comparison to the other?—A. I have no definite figures on that. I am informed that the Rolls-Royce is a slower machine; less in energy by 20 horsepower, and I believe that the fuel consumption of the Liberty is a good deal higher, but I am inclined to say that their fuel consumption will be the same in higher altitudes.

Q. What do you think of the Spad machine?—A. It makes a very good impression.

Q. Is it not a fact that it is the best single-seater fighting machine built?—A. I think so.

Q. You have made a report on the Liberty motor which was tested on June 7 and would you be so kind as to attach a copy of that to what the stenographer is recording?

Maj. MUHLENBERG. Yes, sir; I will.

Q. Now, I am going to ask you if you have any other suggestions to make looking to the improvement of the Liberty motor, and if you have any suggestions, I wish you would make them a part of this answer. Write them out in full and submit them to the commanding officer so that they can go forward with the transcript. We would like to have your views fully and frankly and we will appreciate any suggestions you will make.

I want to ask you this further question. Are you familiar with the Italian motor, the Fiat? A. No; I am not familiar with it.

DETROIT, MICH., June 8, 1918.

Hon. C. F. THOMAS,
United States Senate, Washington, D. C.

SIR: In compliance with your personal instructions of June 6, we herewith inclose copies of documents covering royalties on aeroplanes.

Respectfully, yours,

FISHER BODY CORPORATION,
By LOUIS MENDELSSOHN,
Treasurer and Chairman of Board.

Copy of paragraph taken from contract 2168, Order 20207, req. A-4663, "Signal Corps United States Army contract for aeronautical equipment."]

Royalty.—Any royalties or payments which the contractor may be obliged to assume or pay for the use of any patent rights in connection with the production of the articles may be included in actual cost. It is understood that the contractor may join the Manufacturers' Aircraft Association (Inc.), and as long as the contractor is obligated to pay certain moneys into said association per plane manufactured the Government shall reimburse the contractor for said payments as a part of its costs, and for that purpose such payments shall be treated as royalties, as defined in this contract. The payment of these amounts in good faith by the contractor shall be conclusive of his obligation to pay the same, unless the contractor is notified by the Government not to do so, in which event the Government shall protect the contractor on its refusal to pay said amounts.

NEW YORK, March 29, 1918.

FISHER BODY CORPORATION,
Detroit, Mich.

GENTLEMEN: Inclosed herewith are two copies of the printed form of a supplemental agreement modifying the cross-license agreement, also a copy of a letter from the Secretary of the Navy approving for himself and the Secretary of War the proposed modification of the agreement and urging its prompt acceptance by all of the manufacturers of aircraft under Government contracts. This supplemental agreement has been drawn to conform to the conditions laid down by the Secretary of the Navy and has been approved in form and substance by the Wright-Martin Aircraft Corporation and the Curtiss Aeroplane & Motor Corporation, and is now ready for the approval and acceptance of the other subscribers to the original agreement.

You will note from reading the supplemental agreement that by its provisions the manufacturers are relieved from the dilemma regarding the dispute as to whether or not royalties for the use of aeroplane patents were a proper element of cost under the cost-plus contracts. Before the acceptance of this modification of the original agreement the manufacturer was in peril of protracted patent litigations or the payment of \$200 per plane out of his profit under the cost-plus contracts. As you have observed, the modified agreement calls for the payment of \$100 per plane on shipments since January 1, 1918, and the Government agrees to reimburse the manufacturer.

Please have the supplemental agreement approved by the proper officials of your company and return to us promptly so that this important matter may be finally disposed of.

Yours, very truly,

MANUFACTURERS AIRCRAFT ASSOCIATION (INC.).
S. S. BRADLEY, *General Manager.*

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, April 11, 1918.

From: Office of Chief Signal Officer.

To: Fisher Body Corporation, Detroit, Mich.

Subject: Modified cross-license agreement.

1. The Secretary of the Navy and the Acting Secretary of War have approved the modified cross-license agreement providing for royalty payments of not to exceed \$2,000 on account of patents owned by the Wright-Martin Aircraft Corporation, and the Curtiss Aeroplane & Motor Corporation, the Curtiss Motor Co., Glenn H. Curtiss, Alexander Graham Bell, and Charles J. Bell, trustee, all of which patents were presumed to be included in the cross-license agreement, and which patents have or should be transferred to the Manufacturers' Aircraft Association. This agreement also meets with the approval of the Chief Signal Officer of the Army, and you are advised that it will be proper for you to sign said agreement.

2. The approval of the Acting Secretary of War is subject to the condition that the Manufacturers' Aircraft Association shall present proper evidence showing that it possesses title to all patents owned by the Wright-Martin Aircraft Corporation and the Curtiss Aeroplane & Motor Corporation, the Curtiss Motor Co., Glenn H. Curtiss, Alexander Graham Bell, and Charles J. Bell, trustee, and that it has the right to grant licenses under all of said patents.

3. The accountants of the finance department of the Signal Corps will be instructed to pass royalty payments made by your company as soon as the Manufacturers' Aircraft Association has furnished proper evidence as to its title and right to grant licenses under each and all of the aforesaid patents.

By direction of the Chief Signal Officer of the Army.

A. C. DOWNEY,
Major, Signal Corps, United States Army.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, April 11, 1918.

From: Office of the Chief Signal Officer.

To: Fisher Body Corporation, Detroit, Mich.

Subject: Modification of cross-license agreement.

The Secretary of the Navy and the Acting Secretary of War have approved the modification of the cross-license agreement providing for royalty payment.

Mr. S. S. Bradley will bring this modified agreement to you for your signature.

This is simply to advise you that the Chief Signal Officer approves of your signing this supplementary agreement.

By authority of the Chief Signal Officer of the Army.

E. A. DEEDS,
Colonel, Signal Corps.

NEW YORK, April 8, 1918.

FISHER BODY CORPORATION,
Detroit, Mich.

GENTLEMEN: I have just wired you as follows: "A letter from the Acting Secretary of War of April 5 urges prompt acceptance of the supplemental cross-license agreement. Necessary to hear from you before we can report. Please wire," which I hereby confirm.

Inclosed herewith please find a copy of the letter from Mr. Crowell, Acting Secretary of War.

Referring to this important subject, we trust that you have been able to give prompt reply to our telegram, so that we may be able to make a report and terminate this matter.

Yours, very truly,

MANUFACTURERS AIRCRAFT ASSOCIATION (INC.),
S. S. BRADLEY, *General Manager.*

WAR DEPARTMENT,
Washington, D. C., April 5, 1918.

Mr. SAMUEL S. BRADLEY,
Manufacturers' Aircraft Association (Inc.),
New York City.

DEAR SIR: I beg to acknowledge your letter referring to the subject of the cross-license agreement and supplemental cross-license agreement and the letter of the Secretary of the Navy of March 28, 1918, in regard thereto. I desire to express my concurrence in the action of the Secretary of the Navy. In consideration of reduced royalties provided for on the patents now owned or controlled by the association or its subscribers for use on all airplanes manufactured and delivered to the United States Government during the period of the war, I will agree—

1. That the contracting and disbursing officers of the War Department shall allow, and will be directed to allow, as an element of cost in all cost-plus contracts for the construction of airplanes for the United States Government during the period of the war the royalties paid to the Manufacturers' Aircraft Association in the amount provided for in the supplemental agreement and in the manner provided for in said cross-license agreement as modified by the supplemental agreement.

2. That the War Department will pay to the Manufacturers' Aircraft Association (Inc.), a royalty of \$100 per plane on all airplanes manufactured by the War Department in the United States during the period of the war. It is understood that the payments so made shall be included in the \$2,000,000 total allowed to the owners of the patents during the period of the war, and with a further understanding that a detailed agreement will be made setting forth that such payments shall be complete and full compensation for the use of all the patents now owned or controlled by the Manufacturers' Aircraft Association (Inc.) or its subscribers for the airplanes manufactured for the War Department during the period of the war. Said payment of \$100 per plane shall cease when the sum of \$2,000,000 has been realized by the owners of the patents.

In short, concurring with the Secretary of the Navy, I agree to the same arrangement for the War Department as was made by him for the Navy Department in his letter of March 28. However, after conferring with the Secretary of the Navy, and in order that there may be no misunderstanding of the matter, it is understood that it is not the intent of this letter nor of the letter of the Secretary of the Navy, dated March 28, 1918, that either the War Department or the Navy Department agrees to pay or allow as an element of cost royalties for after acquired patents under the provisions of section 5 of the original cross-license agreement. It is understood that the question of the amount and propriety of any such payments is left for future disposition.

I understand that all necessary steps to insure the legality of the right of the Manufacturers' Aircraft Association (Inc.) to license under the patents in question are being taken and will be completed.

I trust that the modification proposed by the supplemental agreement will be accepted promptly by manufacturers of aircraft under Government contracts and by the owners of the patents.

Very truly, yours,

BENEDICT CROWELL,
Acting Secretary of War.

The above is concurred in by the Navy Department.

FRANKLIN D. ROOSEVELT,
Acting Secretary of the Navy.

NAVY DEPARTMENT,
Washington, March 28, 1918.

MY DEAR SIR: I have seen the proposed supplementary agreement modifying the terms of the original cross-license agreement between the manufacturers and the Manufacturers' Aircraft Association (Inc.), granting a preferential royalty to the Government and limiting the maximum amount of royalty to be paid to the owners of the patents during the period of the war to \$2,000,000.

This agreement, as modified, meets the conditions laid down by me and should be accepted promptly by all manufacturers of aircraft under Government contracts, and by the owners of the patents.

In consideration of the reduced royalties therein provided for on the patents now owned or controlled by the association or its subscribers for use on all airplanes manufactured and delivered to the United States Government during the period of the war, I will agree:

1. That the contracting and disbursing officers of the Navy Department shall allow, and will be directed to allow, as an element of cost in all cost-plus contracts, the royalties paid under the cross-license agreement and the supplementary agreement above referred to, to the amount and in the manner provided for in said agreement.

2. That the Navy Department will pay to the Manufacturers' Aircraft Association (Inc.), a royalty of \$100 per plane on all aeroplanes manufactured by the Navy Department. It being understood that the payments so made shall be included in the \$2,000,000 total allowed to the owners of the patents during the period of the war and with the further understanding that a detailed agreement will be made setting forth that such payments shall be complete and full compensation for the use of all the patents now controlled by the Manufacturers' Aircraft Association (Inc.) for the aeroplanes manufactured by the Navy Department during the period of the war. Said payment of \$100 per plane to cease when the sum of \$2,000,000 has been realized by the owners of the patents.

I have conferred with the Acting Secretary of War about this matter and he authorized me to say that he concurs in the statements made above, with the understanding of course, that the same agreement made to the Navy Department will operate with respect to the War Department. And if the War Department shall undertake to manufacture its own planes it will agree to pay the same royalty as the provision requires the Navy Department to pay.

Very truly, yours,

JOSEPHUS DANIELS.

Mr. SAMUEL S. BRADLEY,
Manufacturers' Aircraft Association (Inc.), New York City.

DETROIT, MICH., April 10, 1918.

S. S. BRADLEY,
Manufacturers' Aircraft Association, New York City.

Finance department, Equipment Division, Washington, informed us to withhold until further advised by them.

FISHER BODY CORPORATION.

WASHINGTON, D. C., April 11, 1918.

FISHER BODY CORPORATION:

Will call on you Saturday with order from finance division authorizing you to sign supplemental agreement. Please have ready to deliver to me then.

S. S. BRADLEY.

APRIL 8, 1918.

Maj. H. S. BROWN,
Signal Equipment 51, 119 D Street NE., Washington, D. C.

Manufacturers' Aircraft Association have written Fisher Body Corporation requesting execution of modified cross-license agreement providing for payment of \$100 per plane. Attached to communication is copy of letter of Secretary of Navy dated March 28 directing total payments aggregating \$2,000,000 during period of war. This letter indicates Acting Secretary of War has concurred in arrangement. Aircraft

association to-day wired Fisher requesting immediate execution of agreement. Please wire Fisher instructions as to whether or not they should sign license agreement; also advise me if Aircraft Board and Chief Signal Officer have approved these payments. Fisher will expect reimbursement of any amounts paid aircraft association for royalties.

Maj. S. E. WOLF.

NEW YORK, N. Y., April 8, 1918.

FISHER BODY CORPORATION, *Detroit, Mich.*

A letter from Acting Secretary of War of April 5 urges prompt acceptance of the supplemental cross-license agreement. Necessary to hear from you before we can report. Please wire.

S. S. BRADLEY.

WASHINGTON, D. C., April 9, 1918.

FISHER BODY CORPORATION:

Finance department, Equipment Division, has been advised unofficially that modified cross-license agreement providing for payment of \$100 royalty meets with approval of Secretary of Navy and Acting Secretary of War. Supposed agreement will probably meet with approval of Chief Signal Officer and Aircraft Board. Manufacturers' Aircraft Association has been requested to furnish contract section with evidence that they hold title and right to license under all patents controlled by Wright, Martin, and Curtiss. Assuming that agreement meets with approval of Chief Signal Officer our accountant will be instructed to pass royalty payment as soon as Manufacturers' Aircraft Association has furnished proper evidence showing that they possess title to all patents in question. Until such time as this evidence is furnished royalty payment will not be allowed.

SIGNAL EQUIPMENT 52.

APRIL 9, 1918.

FISHER BODY CORPORATION,
Detroit, Mich.

Finance department, Equipment Division, has been advised unofficially that modified cross-license agreement providing for payment of \$100 royalty meets with approval of Secretary of Navy and Acting Secretary of War. Proposed agreement will probably meet with approval of Chief Signal Officer and Aircraft Board. Manufacturers' Aircraft Association has been requested to furnish contract section with evidence that they hold title and right to license under all patents controlled by Wright, Martin, and Curtiss. Assuming that agreement meets with approval of Chief Signal Officer, our accountants will be instructed to pass royalty payments as soon as Manufacturers' Aircraft Association has furnished proper evidence showing that they possess title to all patents in question. Until such time as this evidence is furnished royalty payments will not be allowed.

SIGNAL EQUIPMENT 52.

(Mail copy, confirming telegram sent this day.)

AIRCRAFT PRODUCTION.

MONDAY, JULY 8, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 3 o'clock p. m., pursuant to call of the chairman, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), New, and Frelinghuysen.

STATEMENT OF JAMES S. DOUGLAS.

Senator NEW. Mr. Douglas, please state your name.

Mr. DOUGLAS. James Stuart Douglas.

Senator NEW. What is your business in private life?

Mr. DOUGLAS. I am a miner.

Senator NEW. State your connections.

Mr. DOUGLAS. I am president of the United Verde Extension Mining Co., of Jerome, Ariz., and of 233 Broadway, New York, and I live at Douglas, Ariz.

Senator NEW. Have you had any recent connection with the American Red Cross or any other American agency operating in connection with the war in Europe?

Mr. DOUGLAS. Yes.

Senator NEW. What has been that connection?

Mr. DOUGLAS. I am now chief of the section of stores of the American Red Cross, with headquarters in Paris.

Senator NEW. How long have you occupied that position?

Mr. DOUGLAS. Since the 3d day of November, 1917.

Senator NEW. You have been in Paris or in France substantially all the time since then, have you?

Mr. DOUGLAS. Yes, sir.

Senator NEW. What have been your opportunities for observing the operations of American troops over there within that period?

Mr. DOUGLAS. It was the duty of the section of stores of the American Red Cross to fill requisitions made by the donating depot of the American Red Cross for medicine, and in some cases for machinery, delivering the same to the United States Army in France; furthermore, having lived down on the frontier, Mr. William H. Brophy, the assistant chief of the section of stores of the American Red Cross, and myself have had for some years the opportunity of making the acquaintance of Army officers and others who have been stationed at Douglas, Ariz., and at other points long the line, and naturally those friends call upon us when visiting in Paris. and we met a good many Army officers in a social way as well as in a business way.

Senator NEW. You mentioned Mr. William H. Brophy. Was he over there with you and in what capacity?

Mr. DOUGLAS. Yes, sir. He came over as assistant chief of the section of stores and is there now, operating that department.

Senator NEW. This committee, of course, is chiefly interested in the subject of aeroplanes and the engines with which aeroplanes are operated. We are addressing our investigation more particularly to those subjects. I will ask you first to tell us what you can about the number of American planes over there, the number of engines that have been delivered, to your knowledge, up to the time of your leaving there, and any other general information that you may have on that subject. First you may state when you left France to return to this country.

Mr. DOUGLAS. I left Paris on June 8 and the port on June 11. To the best of my recollection the first Liberty motor was received in France not over three months ago, and I was told a few days before leaving Paris by a friend of mine with whom I talked on the street that he thought that certain Liberty motors had been received in France. It was my understanding that these Liberty motors were being attached to French planes, and that the entire American machines had not been received from America.

Senator NEW. No American machine, merely the motor?

Mr. DOUGLAS. Merely the motor, in so far as the Liberty motor was concerned.

Senator NEW. Was the position of this friend, and his opportunity for learning the facts sufficient to make his statement dependable?

Mr. DOUGLAS. Yes; I think so.

Senator NEW. You have said that to the best of your knowledge no American planes had been received in France up to the time of your leaving there?

Mr. DOUGLAS. Up to the time that I left France. What I wished to say was that the planes had not come from America along with the Liberty motors. About the time that I left Paris I was informed that some American planes were being received, but whether they were planes bearing the Liberty motors or not I do not know.

Senator NEW. But your information was that they were just beginning to arrive?

Mr. DOUGLAS. Yes, sir.

Senator NEW. Was anything said to you at that time as to whether those machines had been tested on the French front after their arrival?

Mr. DOUGLAS. The Liberty motors?

Senator NEW. Either the Liberty motors or the planes?

Mr. DOUGLAS. They were then being received. Do you mean those that were then arriving?

Senator NEW. Yes.

Mr. DOUGLAS. No.

Senator NEW. You do not know whether there had or had not been a test of them up to that time?

Mr. DOUGLAS. I do not know.

Senator NEW. Is there any other information that you have on the subject of aeroplanes or aeroplane motors made in the United States and designed for use by ourselves or our allies?

Mr. DOUGLAS. No; nothing excepting the ordinary cheap talk that has been prevalent regarding the Liberty motor. That is all. And it is not fit to record, because it is a jumble and nothing else. Of course, Senator New, you appreciate the fact that American fliers are flying with French and English planes to quite a considerable number in France.

Senator NEW. We quite understand that.

Mr. DOUGLAS. They are the planes that I understand were ordered by Col. Bolling when he first went to France.

Senator NEW. Yes; that is what I had in mind when I addressed my last question to you. I was coming to that. Do you know that Col. Bolling ordered a lot of combat planes in France to be turned over to the American troops and intended for their use?

Mr. DOUGLAS. I understand so, and it is those planes that the American troops have been using largely, as well as planes loaned to the American aviators by the French and British.

Senator NEW. Do you know how many planes were ordered by Col. Bolling?

Mr. DOUGLAS. I do not know, but I have been told that it was either 1,000 or 1,500.

Senator NEW. Have you any knowledge of how many of them had been delivered up to a week ago.

Mr. DOUGLAS. Yes; but I do not remember the figures. I think a considerable number, perhaps two-thirds or three-fourths of the entire order.

That reminds me. I know here some man I met in New York the other day—a lawyer—had been making contracts for the ordering department of the Aviation Service. His name is Alexander Tanner. He told me some figures on that the other day that I think must be very definite. I just mentioned that because perhaps you could readily get those figures from him much more accurately than you could from me.

(Whereupon, at 3.30 p. m., the subcommittee adjourned until Tuesday, July 9, 1918, at 10.30 o'clock a. m.)

AIRCRAFT PRODUCTION.

TUESDAY, JULY 9, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 10.30 o'clock a. m., pursuant to the call of the chairman, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present, Senators Thomas (chairman), Reed, Smith of Georgia, New, and Frelinghuysen.

STATEMENT OF MAJ. CUSHMAN A. RICE.

Senator REED. Major, please state your name, place of residence, and your rank in the Army.

Maj. RICE. My name is Cushman A. Rice, major, Air Service, residence in no one place but usually live at the Army and Navy Club, New York City; also Willmart, Minn., and the Island of Cuba. I have homes in each place.

Senator REED. How long have you been connected with the military service?

Maj. RICE. Off and on, more or less directly since 1898. I was in the service then. This service has not been continuous, though.

Senator REED. What has been your service, just very briefly?

Maj. RICE. I served in the Spanish-American War and in the Philippines. In the Philippines I had various details, including three staff details, and command of scouts, and I was appointed second lieutenant by President McKinley, just at the opening of the war, in the Regular Army, but did not serve in that capacity, as I held increased rank continually in the different volunteer organizations which were raised for service at that time. I left the service in 1902, I think, and since then I have been in service of several foreign countries, and volunteered my services here about one month before we went into the present war.

Senator REED. What foreign countries?

Maj. RICE. Central and South America. In Venezuela and Honduras and Nicaragua, and also I was over in China to aid Yuan Shika to take over the Empire, but he got cold feet; we had everything ready, but he dallied with the orientalism of those people, waited until the psychological moment passed, then managed to get palace fever, as they call it over there, which is a polite name for poison. Then I joined the American Air Service sometime, I think, last June.

Senator REED. What rank did you have in the Army or in our service at the time you went into the air service?

Maj. RICE. I had no rank whatsoever, but the Secretary of War, in the presence of Senator Nelson, offered me a lieutenant colonelcy and a possible colonelcy of Infantry if I would go to one of the officers' training camps; but I contended that with the military service I had I did not need to be drilled in the manual of arms for three months, and he said he doubted if exceptions would be made to the rule that all officers had to attend camps. So I saw Gen. Squiers, and I enlisted as a private in the Regular Army and took the Signal Corps course in flying. I had already been interested in aviation before, in 1910, so I knew a good deal about it; but I went into the Army as an enlisted man, and served my time for three and one-half months as a sergeant in Mineola, Long Island.

Senator REED. Then where did you go?

Maj. RICE. Then I was promoted, on the recommendation of the board that passed on me there upon completion of my training, to a majorship. From there I went to Cuba and to Texas. The Cuban Government was to build—I think it is building now—an aviation field. And from there I went to Fort Worth, Tex., organized two squadrons, and was in charge for a while of the advanced flying.

Senator REED. At Fort Worth?

Maj. RICE. At Fort Worth, for a short time.

Senator REED. How much experience had you had in flying up to that time?

Maj. RICE. Well, at this time I was flying.

Senator REED. You were at Fort Worth. Were you at any other American fields before you went to France?

Maj. RICE. No, sir; only Mineola and Fort Worth. I was at two of the different fields at Fort Worth.

Senator REED. And you had a chance to observe the air conditions, etc.—the weather conditions—at those places pretty thoroughly, did you?

Maj. RICE. Yes, sir.

Senator REED. You then went to France at what time?

Maj. RICE. I went to France—I think it was the 26th day of January that we sailed.

Senator REED. And you have been in France ever since, until what time?

Maj. RICE. France and England. I was in England part of the time on duty commanding an American provisional aviation brigade.

Senator REED. When did you return from France?

Maj. RICE. I landed in the United States the 2d day of July.

Senator REED. What have been your duties while you have been abroad?

Maj. RICE. I went abroad in command of 20 United States aero squadrons, a very large aerial organization, and I commanded those in the shape of a provisional brigade on the ship and in England until arrangements were made to send these units, most of them being enlisted men, mechanics; most of them were sent to different plants and airdromes in England for instruction. Then I took four American squadrons to France.

Senator REED. How many were in a squadron, approximately?

Maj. RICE. These squadrons were larger than the regular American and English squadrons. These large squadrons had 204 enlisted men.

The CHAIRMAN. In each squadron?

Maj. RICE. Yes, sir; and 25 flying officers, also 5 ground officers, as against about 150 to 180 in the American and British organization.

Senator REED. You had how many of those squadrons, you say?

Maj. RICE. There were four of them.

Senator REED. You took them from France to England?

Maj. RICE. I took them to France from England. Two of them were sent to American headquarters, and the units of the other squadrons were divided in flights and were attached to British flying squadrons on the front. There were already two of the large squadrons with the British that had been sent over a few weeks before we got over. These units, all of them, were scattered from Paris to Calais, all along the British line, and they were working with the British operating squadrons on the front, the enlisted men learning the engines, the assembly, and method of operation of the British machines. Practically all of them were under fire a good deal of the time they were over there.

Senator REED. Were you in command of all these squadrons that you have spoken of?

Maj. RICE. Yes, sir; for a time I was inspector for all the units that were with the British on the front and in England. Then, by a verbal order of the commander in chief of the air service, I was put in command of those with the British on the front in France, in addition. I never got to England on this order, having so much to do on the front. This is the order, you can see [producing paper]. This orders me to make inspections of all the units operating with the British and also all the American aviation units training in England. I do not know exactly, but there must have been 240 different units left in England studying at different airplane factories and areodromes getting advanced training, the mechanics, you know. We had about 300 of our fliers training in English schools. Very good training it was, too.

Senator REED. Who was actually in charge of the whole of this American flying troop; who was the commander in chief?

Maj. RICE. The commanding officer of all American aviation in France was Gen. Benjamin Foulois.

Senator REED. You were under him in charge of the inspection and what else?

Maj. RICE. And the discipline and the maintenance of the units that were on the fighting front. I inspected them and directed how they should operate with the British. They each had an officer with them, and the only thing I looked after particularly was to see that they aided the British all they could, and in the meantime got all the knowledge and information they possibly could of machines and conditions.

Senator REED. Where did these men that you had there on the front get their flying training?

Maj. RICE. These men were, until the very last, not flying men. They were the personnel of the squadrons—the work personnel. Most of the flyers were in England taking their advanced training in fighting machines.

Senator REED. Then these men you had were the mechanics?

Maj. RICE. They were the mechanics, the riggers and fitters, and other expert work personnel.

Senator REED. It was their business to take a machine and put it in prime condition to fly, and when it came back from a flight to examine it and put it in condition again?

Maj. RICE. Yes; and if anything happened to it to repair it. In other words, keep the flyer in the air safely.

Senator REED. You had charge of that entire force along the entire line in France and England?

Maj. RICE. Yes, sir; for a time.

Senator REED. Wherever any of these Americans were they were under your inspection and charge?

Maj. RICE. Yes, sir.

Senator REED. And you in turn reported to Gen. Foulois?

Maj. RICE. To Gen. Foulois; yes, sir. Later on, before I left a great many of our pilots who had been trained in England were coming over to the British pilot pool. They have what they call a pilot pool; all pilots are put into it and drawn out according to their training and date of arrival and assigned to squadrons as the squadron commander needs them. A fighting squadron on the front will send to the pool to get as many of these men as they need to replace losses. They are taken out just as they come, and the British took our American pilots and put them on absolute parity with their own, only they usually sent them to squadrons where I had mechanics working.

Senator REED. Where you had a squad of American mechanics working they would send these men?

Maj. RICE. They would quite often send American flyers. Judge Landis's son was one of the first that was drawn from the pool over there, that I saw.

Senator REED. Judge Landis, of Chicago?

Maj. RICE. Yes, sir; his son. He did very well, indeed, and our own American mechanics kept his British machine flying.

Senator REED. After you got American flyers over there what kind of flying machines were they furnished, American machines?

Maj. RICE. No, sir; they were absolutely British. They drew their machines the same as the British pilots would. Forty squadron, for instance, had Sopwith Camels, these men, Americans—there were four of them when I left, Landis and three others—draw their machines the same as the British pilots did; the same care was taken, only in some instances, as I say, they were given American mechanics to keep up their machines for them.

Senator REED. Then, do I understand that the British, by this system of pooling, put our men absolutely with the British?

Maj. RICE. Absolutely on a parity. They made no discrimination whatsoever.

Senator REED. The Americans, then, serving in this way—all the Americans that were over there, the flying troops under you—all that were flying when you left were all furnished with British machines?

Maj. RICE. All were furnished with British machines. If they were in bombing squadrons, they were given D. H. 4's or night flying F. E.'s or other machines. If they were fighters, they were given Bristol fighters or S. E. 5's or Sopwith Camels, with absolutely regular British equipment of the very latest type.

Senator REED. Did you see any American machines going over there up to the time you left?

Maj. RICE. No, sir; I never saw any American machines. Of course, I would not be expected to, because there was no attempt to get American equipment up there. We operated on an agreement with the British Government that they would train our men for their machines, and the squadrons would operate with the British. When I left they were reuniting these squadrons, taking all the American flyers, all the American mechanics, and fighting them as a unit, equipped by the British Government. We give them three months' notice when we want them back; then we turn in the equipment to the British; in the meantime they equip us exactly the same in every way with motor repair shops, and with everything that they give their own squadrons, and never stinted anything. They played absolutely fair with us. Gen. Salmond and Gen. Fisting, commanding the Royal Air Force, did everything they could to make the American units with the British comfortable and their training complete and thorough.

Senator REED. What I want to get clearly in mind is this: Was there another part of the line where there were other Americans that were not under you that may have been using American machines?

Maj. RICE. Yes, sir. Col. Mitchell was at the head of some active American flying squadrons; they were using French material, I think, from what I heard in a conversation. I heard a great deal of talk about it. We used to swap stories at headquarters, as to what they were doing. All along the line they were flying quite successfully and doing very well. Some of these flyers' names you have probably heard—Rickenbaker and Compbell were among them.

Senator REED. They were with the French?

Maj. RICE. No; with the Americans.

Senator REED. But flying French machines?

Maj. RICE. Flying, I imagine, mostly French material.

Senator REED. But you could not now be perfectly definite about whether some of them might have had American machines?

Maj. RICE. I could not positively say, because I only went up on the American front once and visited around. At that time I did not see American machines, but I do not know but that there might have been American machines there. There is no question that there are Liberty motors on some machines at a couple of the fields near Paris, because officers of mine have been out there and told me of seeing them.

The CHAIRMAN. When?

Maj. RICE. Lately.

The CHAIRMAN. I was going to say it must have been recently.

Maj. RICE. Yes, sir; about the 10th of June.

Senator REED. Am I accurate in this? That for all practical purposes the Americans that have been in service on the front, up to the time you left, were operating either English or French machines?

Maj. RICE. The Americans that were operating in my sector were all equipped with British machines. Of course, as I say, that was under a contract with the Royal Air Force. If we had had a million American machines on the American front, the squadron with the British would have still been flying British equipment, because our men were trained entirely for that purpose.

Senator REED. But you did not see any other Americans up there running other machines?

Maj. RICE. Yes, sir. I saw a couple of Americans flying Spads and Brequets, but they were with the French. The French lapped up later on; you know they took a part of the British line up near Montdidier, and up through there; they had a few Americans flying Brequets and Spads.

Senator REED. So that the story may be complete as to your service, you have charge of these American units that were engaged in the manner you have stated with the British, how much of the battle line did they take; how much of the battle front?

Maj. RICE. They extended the entire front from the sea to the end of the British line on the south. When the first attack was on—the big one—the line went down toward Noyon, but later the French took over the line up to Montdidier, south of Amiens, the farthest south I went then was Bertangles. Bertangles is probably 60 kilometers from Paris, and from there all the way up to the sea.

Senator REED. Did you have fliers that served in those battles?

Maj. RICE. Yes, sir; there were quite a number of American fliers that flew regularly in the fighting there. Several of them distinguished themselves. The British admitted that our boys will leave nothing to be desired as to flying; they take to it very naturally, and when they fly with good equipment, after a very, very few days' experience over the line, the British just say, "We do not need to do anything more with you; you are competent pilots."

Senator REED. In any of those battles, were you in the air, or were you engaged in some other service?

Maj. RICE. I was not supposed to do any flying, but I went up several times with British pilots. In the heaviest fighting at the great drive that started March 26 from San Quentin to Amiens. I had one of these American units that was going into an English airdrome very close in under the line, the railroad took us practically on a line beyond Ham, and I was with them during the two days of the heaviest fighting, because we were caught right in that very heavy fighting. In fact, this squadron had a high percentage of loss the night of the 22d of March. Later I got them into Amiens, from there sent them to the back line, then Col. Bolling and myself—Col. Bolling was afterwards killed—believing it would be of benefit to our service to get all the military information and knowledge we could during the time of this great battle, went into the front and joined the British Infantry, machine gun, and artillery units. The morning of the 27th of March Col. Bolling was lost. He was killed in a car; he drove through our line into range of the German fire and was killed, and it was eight days before I was able to get any track of what happened to him. But I stayed there during the entire drive, doing the same as I had been doing with Col. Bolling, going in each day and staying hours with different units of the Fifth Army, that was the Army that was annihilated. This may not interest the committee.

The CHAIRMAN. The lost army?

Maj. RICE. Yes. They were a wonderful bunch of fighters. A great deal has been said and published about their quitting, and that sort of thing; but if that is quitting, then that is the way I want my soldiers to quit. They absolutely stayed for annihilation. One division

went in pretty nearly 10,000 strong, and the third day of the fight the roll call was taken with a view of replacement, and they had 916 men and they were still on the line. It does not leave anything to be desired as to their fighting.

Senator SMITH of Georgia. Those were English?

Maj. RICE. Yes, sir; English.

Senator SMITH of Georgia. What had become of all the others? You do not mean all the balance had been killed or captured?

Maj. RICE. All had been killed or captured. Those were on the front line, and a great many were captured the very first morning after the tremendous barrage. Germany had overprepared on that, you know. They just absolutely tore the ground to pieces; blew great guns up. A 6-inch howitzer we were operating was struck right underneath and blown 20 feet in the air, and at Ham they did not destroy the houses, but took the ground they were built on off. It was the most tremendous thing in the history of artillery, and officers who had been four years in the war told me that everything that preceded that barrage fire was merely child's play.

The CHAIRMAN. That is what they are probably preparing for now?

Maj. RICE. Yes, sir; there is no question about that. Somewhere along the front they are preparing. They have two good logical drives—that is, to gain an immediate result—one between Arras and Amiens, along the valley of the Somme and the Oise into Abbeville. That is only 34 kilometers. That would cut the English and the French armies in two if they were able to accomplish it. That is what they tried to do at that first big drive. The other is, of course, to gain a little farther in on Paris. I doubt if they will succeed in either.

Senator REED. Coming back to the flying business, I wish you would give us a description of the different types of machines that are necessarily used in the air service. I do not mean the make but the types—the kinds.

Maj. RICE. To have a balanced air service, of course, you need at the present time bombing machines—machines that can carry a great deal of high explosives, to go back into these back areas, to destroy depots and rail heads and ammunition dumps—something that can carry a large number of heavy-caliber bombs so as to be very effective, to carry out the policy now adopted of bombing German towns and back areas.

Senator REED. I think you had better proceed to tell us the different types of fighting planes. I mean by that the planes used on the battle front.

Maj. RICE. You do not care for the names of these?

Senator REED. Not at present. I want to get the types. You have spoken of the bombing type.

Maj. RICE. That is the heavy, long-distance bombing type of machine—the type that when it is developed sufficiently probably will bomb Berlin. Then there is the lighter bombing type, the two-seater—something on the order of the F. E.'s or the D. H. 4's, that have a good fighting range, that move rapidly and can handle themselves well and protect themselves; they are equipped with quite a number of small bombs. They will be to a great extent also used

as reconnoissance and photographic machines. They can climb enough so that they can run fairly well when attacked. They usually are two-seaters, so that they are armed pretty heavily forward and rear; the observer is armed with a gun that gives him full range in almost every direction.

Then come, of course, the fast single-seated fighters. They are very necessary and very important, not only for the purpose of going out and getting an individual German reconnoissance machine but to protect all of the reconnoissance and bombing machines.

Senator SMITH of Georgia. The big bomber has to be protected by this little one-seated fighter?

Maj. RICE. Yes, sir; they usually protect them when they come back home. When they go out to their work they sneak over the lines, as a rule, by night; and we know when they will come back, and these fast machines are sent up to escort them, because when they are on their way back they are sure to have a lot of the enemy on them. If they have run a very long ways into German territory and come back about daylight they are sure to meet a great quantity of chasse machines, fighters, ready to jump on them and give them a lacing; this is done by both sides. Consequently, these little, fast, fighting machines have been sent out one or two hours in advance of their coming in to bring the big ones back and to escort them home.

Senator REED. To protect them?

Maj. RICE. Yes. Reconnoissance machines depend a great deal on the protection that they get from small machines. The fighters generally fly much higher than their convoys when they are over the lines photographing and taking pictures; the reconnoissance machines fly at a distance that enables them to take their pictures. As soon as they are attacked by German planes the little fighter that is laying up on top dives down to their assistance.

Senator SMITH of Georgia. To what extent can the two-seated fighting machine compete with the swift one-seated fighting machine?

Maj. RICE. A fighting machine like the Bristol fighter, which is very fast and very mobile in its movements—I shall have to digress a little on that. There is a great deal of difference of opinion. Take a man like Maj. Dallas, who was probably one of the greatest air fighters in the English Army; he said with his little fast Sopwith-Camel he would down any Bristol fighter in the country. Maj. McAlvey, who is also one of the famous fighters, fights with a Bristol fighter. He says he can take any two Sopwith-Camels and put them down with himself and a good man and be in no great danger himself.

Senator SMITH of Georgia. Hence, we have got to use both?

Maj. RICE. We have got to use both. It is imperative to a well-balanced air service. They have certain advantages. The Bristol fighter can be used for bombing also, you know. In fact, all types of machines now in use by the British carry bombs.

Senator SMITH of Georgia. The Bristol fighter is a good deal like our D. H. 4, is it not?

Maj. RICE. The D. H. 4 is originally an English machine of somewhat the same type as the Bristol fighter.

Senator SMITH of Georgia. Our D. H. 4 with the Liberty engine is very much like the Bristol fighter, is it not?

Maj. RICE. No, sir; I am told it is an absolute copy of the British D. H. 4.

Senator SMITH of Georgia. How do they differ from the Bristol?

Maj. RICE. It is a two-seated fighting machine used a great deal for reconnoissance. But a good fighter.

The CHAIRMAN. Pardon me a moment. The so-called Bristol which we have been building in this country is also a two-seater.

Maj. RICE. Yes, sir; but the D. H. 4, the De Haviland type machine is another two-seated machine on the same type as the Bristol fighter, but built with the seats so that the pilot and his observer are seated a long ways apart. The observer is out on the tail pretty well in the D. H. 4; in the Bristol fighter he is closer; they can touch each other.

Senator REED. I am going to ask the committee to indulge me without interposing these questions, because I want to get it in a sort of sequence. You were describing the different types of machines necessary on the battle front and you have spoken of the heavy bombing, the lighter bombing machine, and the single seater, and you were telling me of a single fighter—that it was used to protect these heavier types of machines. Now, is there any other type of machine that is used on the battle front as a necessary part of the equipment?

Maj. RICE. They range in that respect. For instance, as Senator Smith spoke of the De Haviland and the Bristol. The De Haviland is really of the two-seated fighter type but used a great deal for reconnoissance and photographic work. It is a machine of the fighting type enough so as to be classed as a fighter. They vary in different types. Some of them go to the extreme of a two-seated fighter, like the Bristol; others go pretty well out of that range and get almost into a reconnoissance and bombing machine and still all are in the class of two-seated fighters. The value of the fastest of fighting machines, the single seater has been proven in the last big offensives, because they have swooped down on the line during a fight, or during a reorganization of troops. The psychological effect is very tremendous with one of these fast machines coming down, working two or three machine guns on you and dropping bombs indiscriminately. The psychological effect is high, of course; they may not have as much destructive effect as a few well-placed heavy shells, but the men do not like being attacked from above. They do not like to have it coming down on top of them that way. I know I left a battery very rapidly when two German machines came over and machine gunned us, and I noticed I was probably among the last getting out, too; we had been standing the fire of guns of a great deal heavier caliber than those two machines could deliver for some time.

Senator REED. The chief quality of the heavy bombing machine is the long range of flight and the weight of load they can carry?

Maj. RICE. The greater amount of explosive they can carry and the longer distance they can travel the more serviceable they are.

Senator REED. The class of machine which is used for reconnoissance and photographing and so forth is not required to make long flights?

Maj. RICE. No, sir; they have a gas capacity probably of only four hours.

Senator REED. What would be the gas capacity or hours of flight of the heavy bombing machines?

Maj. RICE. They have to be able to make 6, 8, or 10 hours and more; it depends entirely on the distance they have to go.

Senator REED. The more gasoline you carry the less you can carry of other weight?

Maj. RICE. Yes, sir.

Senator REED. The fighter pure and simple is this single-seated fighter and the two-seated fighters?

Maj. RICE. The most of them carry 2-hour gas capacity or 2 hours and 15 minutes. They are built for speed.

Senator REED. And climbing?

Maj. RICE. They are very rapid climbers and quick maneuverers.

Senator REED. I understand the heavy bombing machine is a great, heavy, steady machine, weight carrying, and does not need to be very fast?

Maj. RICE. It has to be pretty heavily armed; it is not so fast, and it is always open to attack from these fast little fellows, or from two-seated fighters, consequently they carry a pretty heavy armament. They have got to have good guns on them; and have to be able to protect themselves to a great extent. The most protection they get, of course, is when they get close to the line coming back, the protection of fighters that are sent out to help them.

Senator REED. Speed is a considerable element in the light-bombing machine, is it not?

Maj. RICE. Oh, yes; speed is always an element even in the big machines. If you can increase your speed you have increased the efficiency, if you do not sacrifice too much of something else.

Senator REED. I want to take up these types of machines in the order that you have spoken of them, and I wish you would tell us from your experience on the front what you regard as the best type of heavy bombing machines that you came in contact with, and then also in that connection if there are other machines of good types that you did not come directly in contact with, tell us about them.

Maj. RICE. You see I am practically limited to what the English use, as I saw but very little of the other types of machines. I have seen some of the French machines operate and saw some very good work done by some of them, and I have seen a couple of Italian machines operate, but to know them and to be conversant enough to express knowledge of the operation I am only able to do so with any authority as to the British.

Now, with the British most of their bombing has been done so far by D. H. 4's and F. E.'s. They are not particularly heavy machines and do not carry a particularly big load, but they have been very successful in their bombing work. They are now building and operating some very large Handley Pages. Most of them I think have Rols Royce motors, and they are going to carry a tremendous load.

Senator REED. Have the British to any great extent used these large Handley Page machines over there?

Maj. RICE. No; they are rather new. They have had some, but they have not used them to any particularly great extent until lately.

Senator REED. Do you think they used them enough so they can be said to be a thoroughly tried out machine?

Maj. RICE. Oh, yes; I believe they have. They are pretty cautious, the English are, in manufacture. They take their war pilots

over and do all their experimenting under war conditions, as far as possible, and they do it very thoroughly. They send one set of pilots after another over. Usually when the British service passes a machine it is a pretty serviceable machine when it comes out to the front. There may be a few changes to make but not many.

Senator REED. Do you know what the range of flight will be of those Handley-Page machines?

Maj. RICE. No, sir; I do not know accurately, but they must be quite large because there is serious talk in the air service of bombing Berlin with them, so they must have a very long range of flight.

Senator REED. Is that serious talk among men who know about flying?

Maj. RICE. Absolutely, among men of high command. They really believe that very shortly they will be able to bomb Berlin.

Senator REED. The Handley-Page is a large machine, and did you say the De Haviland?

Maj. RICE. They use the De Havilands a great deal. Some of the most successful night bombing has been done by some British squadrons operating down in the American sector with D. H. 4. It is a short line into the Rhine towns from there. That is why they were sent down in that section in the Vogas hills, and they have been doing some very successful night bombing from there with the De Havilands.

Senator REED. That De Haviland is substantially the same machine we are making now, is it not?

Maj. RICE. I have not seen one here. I could tell if I saw them. There is one down here. I can find out any time.

Senator REED. We understand that.

Maj. RICE. But it is supposedly a copy of the British De Haviland.

Senator REED. Except the engine?

Maj. RICE. Yes.

Senator REED. You have mentioned the best of these types of bombing machines that are used by the British. Now, what are the types of fighters they use?

Senator SMITH of Georgia. Would you not say one-seated fighters?

Senator REED. Yes; one and two seated fighters.

Maj. RICE. The two-seated fighter comes about next in order after the light bombers. Speaking of light bombers, there is the F. E., you know, the British F. E. machines do a tremendous amount of bombing, especially night work.

Senator REED. What are they, single seaters?

Maj. RICE. No; they are a two seater, and they are a very odd looking machine of the pusher type. The first one I saw I thought someone had been experimenting and the machine was not completed. There were no fuselage covers, or anything, just frames. It was the funniest looking machine I ever saw, but they get very good success, and as night fliers the British like them very much.

Senator REED. Do they carry two men?

Maj. RICE. Yes, sir; they also have a single-seater type.

Senator REED. What armament do they carry?

Maj. RICE. They carry four machine guns, and they are very popular with the night-flight officers; they say they are very stable

and operate very well. Then, of course, the Bristol fighter is a favorite fighting machine of the squadrons that have them. They claim you have got every advantage in a Bristol that you have in the one seater in action, speed, and stability, in addition to the extra fighting man. They have a very fine motor, the 190-horsepower Rolls-Royce motor, which is a very, very fine motor.

Senator REED. I am going to come to the motor later because that is a sort of separate issue.

Maj. RICE. And they are very popular, the pilots are very anxious to get in the Bristol fighter squadrons, and they say over there that the Germans do not care very much for them when they run across them.

Senator REED. That is, they rather avoid them?

Maj. RICE. They would just as soon have some one else. A Bristol fighter is a terrible affair. The two men operate absolutely close together, touching each other almost, so they can direct each other's attention to what is doing, and guns forward, one gun on a segment, then a cut-out in the floor below, with a stripped Lewis gun so his observer can just turn around if a German gets under and behind him—fire downward and to the rear. That was the only weak spot they had, because they had to broach over, so as to allow the observer to fire below and backward, causing them to lose direction and height, but when the pilot carried this gun down through the floor, the first Germans, until they got onto it, would come sneaking down below and to the rear, and they would say, "This fellow was very careless." Suddenly they would walk into this burst right from the bottom, and it made it as nearly as you can make any machine an invulnerable fighter, especially with the fine equipment that the British carry on it.

Senator REED. So that the English Bristol fighter is a very fine machine?

Maj. RICE. I think it is.

Senator REED. While you are at it, we might as well take that engine for a moment, although I want to take up the engine separately. What is the type of engine used?

Maj. RICE. A 200-horsepower Hispano-Suiza in some of them, but it is not as popular with them as the 190 Rolls-Royce. I think I have a picture of it right here. Here is a picture of the Bristol fighter with its equipment and everything. There is the motor, there is the 190-horsepower engine. [Indicating].

Senator REED. I wish we could have those things to attach. We could not have them reproduced, though, could we?

The CHAIRMAN. We might make a photostatic copy of them.

Senator REED. The picture that you have shown here is from a book which you have of the Royal Air Force, technical notes?

Maj. RICE. That is only a cover. It is not a book. These are issued in the form of bulletins as they come along.

Senator REED. The picture referred to is at page 13 of that part of the document which is devoted to the Bristol fighter, the cut appearing on that page.

The Rolls-Royce is preferred over the Hispano-Suiza in the Bristol fighter?

Maj. RICE. Most men favor it.

Senator REED. What is the claimed superiority of it over the Hispano-Suiza in this particular type of machine?

Maj. RICE. The English fliers that have flown it have had a great deal of success with the Rolls Royce; they say it stands up remarkably well; that practically the only trouble they have had with it has been a little warping of the valves, which, though it will cut power off and reduce efficiency, will not endanger your getting home. It means that you will lose quite a little power and your motor drop down on you badly, but unless it is extremely bad, which it usually is not in those motors, it gives you a safe chance to come home, while if you get a broken connecting rod or a wrist pin gets loose, or something like that, why you are in rather an uncomfortable position if you happen to be a few miles over in Germany. You know that when a main bearing of a motor lets loose it does not make you feel particularly comfortable, or if you have a wrist pin let loose and you hear it knocking and giving every indication that it is going through the wall of the cylinder every instant, it puts the wind up you, as the English say, as to whether or not you are going to get home.

Senator SMITH of Georgia. Is not that a matter of construction?

Maj. RICE. Of material and construction. Picking the material in the first place and the construction. Of course, an engine expert will know more about engines than I, and they say the design has a good deal to do with it, too, because you take a certain design and it puts so much strain on the material that it will knock it to pieces.

Senator REED. I want to proceed with types. I am now coming to the single-seater fighter. What is the most approved type they have over there?

Maj. RICE. The most successful type the British use is the SE-5 and the Sopwith-Comels, and two or three squadrons in the British service are now using the Sopwith-Dolphin. That is a newer type, and is supposed to be a considerable improvement over the Comel, but most of the men who have run both rather prefer the Comel. It is very fast.

Senator REED. What is the speed of the SE-5?

Maj. RICE. All of those single-seater fighters over there get 125 to 130 miles under the best conditions.

Senator REED. Are you acquainted now with the Spad machine?

Maj. RICE. I have seen in operation some single-seated and two-seated Spads. I am not as well acquainted with them as I am with the British type of machine; but what I do know of them I believe the Spad is the best machine the French have for all purposes.

Senator REED. What is the general understanding and reputation that the Spad bears among the fliers who are over on the front, the practical men?

Maj. RICE. The members of the Lafayette Esquadron, who are now in the American Army, all speak very highly of the Spad.

Senator REED. Would you say its reputation is as good as any of the fighting machines?

Maj. RICE. I think the Spad ranks with the French the same as the Sopwith Comel or the SE-5 does with the British.

Senator REED. And, of course, I suppose we may take it as true that the French prefer their machines to the English, and the English

prefer their machines to the French, and, as a matter of fact, an indifferent outsider would find some difficulty in judging which was the better?

Maj. RICE. Well, from what I have noticed and discovered in regard to the machines personally, I think that I would prefer to fly a British machine only for one reason, not that the design is at all better than the Spad or other French types, but that the British are a bit more conservative in manufacture than any of the Latin machines that I have seen; they figure the factor of safety and add a little, and many of the Latin, the Italians and the French, look as if they have gotten right down close to the minimum and probably subtracted a tiny bit.

Senator REED. From the factor of safety?

Maj. RICE. From the factor of safety.

Senator REED. That is, you mean that the British now will put in a little additional weight in order to get strength?

Maj. RICE. They have not absolutely sacrificed strength for weight anywhere.

Senator REED. But the types of machine you think are practically the equivalent of each other, in your opinion?

Maj. RICE. If I were equipping a fighting squadron to-morrow, it would make no difference to me particularly whether they were equipped with S. E. 5's, Sopwith Camels, or Spads; all are very good machines, from what I have seen and heard of them.

Senator REED. I am through now asking about these types of machines. I was going to take up the engine, but as I requested the other members not to ask questions while I was pursuing this line, I should like to give way now on this thing.

Senator SMITH of Georgia. How does the Handley-Page compare with the Caproni?

Maj. RICE. I would not want to express an opinion.

Senator REED. What is the reputation of the two?

Maj. RICE. I rode in the Caproni that Resnati had here last fall, and it seemed to me to fly very well, and he handled it remarkably. He certainly was a very good flyer for that type of machine. I have never flown in a Handley-Page—one of the big ones.

Senator SMITH of Georgia. Are the Handley-Page and the Caproni classed about equal, or if either is regarded as superior, which is superior?

Maj. RICE. Certainly I do not see from the study of aeronautics I have made that it is difficult to build any machine that will carry weight. I do not think that is a wonderful matter of individual design. I think we can design most any kind of a machine that will fly well if you put the right kind of motor in it. It is only a question of its moving through the air, and your speed is given to you by reducing the wind resistance and the wind slippage. I believe anybody who has the knowledge can design a big or a small machine that will give good results, and if you have a good flight sergeant or expert that can rig it so it keeps within well-known principles of air resistance and all that sort of thing it should work well. I do not think the building of the actual frame for carrying an engine is any wonderful engineering feat. Almost any kind of machine I have ever seen, if equipped and rigged properly—by rig-

ging I mean if the wings, tail, and controls are properly set, and that is only a question of pulling up the turnbuckles here or there. A good flight sergeant will take a machine that only develops 110 miles an hour and work over that four or five hours, and you go out and make 125 miles an hour as easily as can be, or he may take a machine that lops over on one side and will correct the thing in an hour or two for you if he knows his business.

Senator SMITH of Georgia. Take the two-seated plane just for a moment. The closer the pilot is to the shooting the better the plane is, you say, for fighting purposes?

Maj. RICE. Yes; they coordinate better for fighting. But, then, again, for observation and for photographic work and things of that sort, and for all types of reconnaissance, that might be an inconvenience. You see, they are crowded in pretty close in a Bristol fighter, though I have seen some of the best photographic work done by the British done by a Bristol fighter squadron.

Senator SMITH of Georgia. Does the two seated plane—the De Haviland 4, for instance—have to have the aid of the one-seated fighter to protect it when it goes out?

Maj. RICE. It depends on what kind of work it is on. If it is down on reconnaissance work and photographic work, it is a pretty good idea to give it some protection from above, but the De Haviland 4 is a type of machine that is pretty heavily armed; it is in the fighter class; it can take mighty good care of itself.

Senator SMITH of Georgia. Ordinarily it is expected to take care of itself?

Maj. RICE. It is, as a rule. It is used a great deal, you see, for practically most of the work of the British in photography; I think the same has been done with the De Haviland 4's, reconnaissance work, and they are pretty well able to take care of themselves; but it is a good idea to put a few fast little machines away up in the air above them.

Senator SMITH of Georgia. It is not regarded, though, as dependent upon this single-seater fighters to protect it?

Maj. RICE. No, sir; a De Haviland flying in a flight of six machines is perfectly able to take care of itself against any reasonable number of the enemy.

Senator REED. I want to get to the question of the engine—the kind of engines that are used in these machines. Let us take the heavy bombing machines. What types of engines are approved?

Maj. RICE. The British use a good many Beardmore, Rolls-Royce, and Sunbeam engines for the heavier machines that I have seen.

Senator REED. Have they been successful?

Maj. RICE. It varies a great deal. I was told, but do not know for a certainty, that the British were building some 450-horsepower new Rolls-Royce motors for some of these new big bombing machines. I have never seen one of them.

Senator REED. They are constantly changing, but their motors have been successful from the first, have they?

Maj. RICE. Oh, no; I do not think they have been successful from the first. They had the same troubles we have run into. They have had to change designs, and what they have now is a pretty highly suc-

cessful lot of motors, but we must allow for the fact that they have been in the work four years.

Senator REED. Have they had, for a matter of the last year or so, motors that have been successful?

Maj. RICE. Oh, yes; all the time I have been with them their motors seem to have been giving pretty good success. Practically all motors I saw were giving reasonable success.

Senator REED. You have spoken of the motor used in the heavy bombing machine; you have also spoken of a type of motor that was used, two types that were used in Bristol fighters. But I believe you did not tell us what motor was used in the light bombing machines?

Maj. RICE. The Spad, that uses a Hispano.

Senator REED. I have not come to the Spad yet. I am speaking about the light bombing motor mentioned.

Maj. RICE. The D. H. 4 equipment is using the 275-horsepower Rolls-Royce motor, a 220-horsepower R. A. F., and in some cases a 200-horsepower B. H. P.; the D. H. 9 has mostly a 200-horsepower B. H. P. motor.

Senator REED. We have talked about the motor in the Bristol, that you say was a Rolls-Royce, and the Hispano Suiza, and I believe I have not asked you what is the motor that is used in the fighting machines; that is, the single-seater fighters, the S. E. 5, and the Sopwith Camels.

Maj. RICE. The S. E. 5 carries a 200-horsepower Hispano motor. The Sopwith Camels have been carrying the 130-horsepower Clerget.

Senator REED. A different motor?

Maj. RICE. Yes; a different motor, the Clerget rotary motor.

Senator REED. What is that, a rotary motor?

Maj. RICE. A rotary motor, and a very successful rotary motor. They also have the Nieuport Scout and the Nieuport two-seater, which carry a 130-horsepower Clerget.

Senator REED. That is also a rotary motor?

Maj. RICE. That is a rotary motor. Then, the Sopwith Dolphin, the fast machine I was telling you about, carries a 200-horsepower Hispano.

Senator REED. So that we find that this Hispano Suiza and the Rolls-Royce are the dominant types of motors used by the British?

Maj. RICE. Yes, sir. Well, the Sopwith pup, for instance—you use a 80 Le Rhone and a 100 horsepower monosupape. The pup was quite a successful machine for a while. It has been succeeded by the Camel, which is an improvement.

Senator REED. That has been practically displaced now?

Maj. RICE. Yes; to a great extent.

Senator REED. Is there any special virtue in these rotary motors?

Maj. RICE. Yes, sir; they are extremely snappy and quick handling. They also have a great advantage; they take very little space; they lay right up close; you get them in a very small area; you can develop a great deal of horsepower in the small space. There are objections to them. For instance, there is a certain type of a Nieuport machine that flies a rotary motor that cuts out into threes; it is a 9-cylinder engine. Some of them pile up the unburned gas and the hot exhaust of the other motors that are operating; set fire to it sometimes. That is rather inconvenient.

STATEMENT OF MR. LEO J. PERRETTE.

Senator NEW. Mr. Perrette, what is your present position?

Mr. PERRETTE. As an Army inspector. It was under the head of the Signal Corps, but I think we have been divorced from that and put under the Industrial Aircraft Board now.

Senator NEW. But you are representing the Government of the United States?

Mr. PERRETTE. Yes.

Senator NEW. Where?

Mr. PERRETTE. At the Willys-Morrow Co., Elmira, N. Y.

Senator NEW. What are they making at the Willys-Morrow Co.?

Mr. PERRETTE. Parts and assembling complete OX-5 motors.

Senator NEW. For use in aeroplanes?

Mr. PERRETTE. Yes, sir; training purposes.

Senator NEW. What kind of airplanes?

Mr. PERRETTE. Training planes. I do not know the type of training they use them in.

Senator NEW. How long have you been engaged in your present capacity?

Mr. PERRETTE. Since the fore part of May. I do not just remember the date.

Senator NEW. What did you do immediately previous to May 1?

Mr. PERRETTE. I was night foreman of inspection in department 49 of the same company.

Senator NEW. That is, you were then in the employ of the company?

Mr. PERRETTE. Of the Willys-Morrow.

Senator NEW. And prior to that?

Mr. PERRETTE. I was chief examiner for the British A. I. D., working directly for the British Government at the same plant.

Senator NEW. What do those initials mean?

Mr. PERRETTE. The aeronautical inspection department.

Senator NEW. How long did you represent the British Government?

Mr. PERRETTE. Three months only.

Senator NEW. And the Willys-Morrow Co.?

Mr. PERRETTE. Two months only.

Senator NEW. You have been the last seven or eight months, then, at that plant?

Mr. PERRETTE. I went to Elmira December 23, 1917.

Senator NEW. And you have been continuously there since that time?

Mr. PERRETTE. Yes, sir.

Senator NEW. Representing first the Government then the company?

Mr. PERRETTE. Then the company.

Senator NEW. Then the United States Government, each in the capacity of an inspector?

Mr. PERRETTE. Yes, sir.

Senator NEW. What was your training that qualified you for that kind of position?

Mr. PERRETTE. Machinist.

Senator NEW. A practical machinist?

Mr. PERRETTE. Yes, sir.

Senator NEW. Where did you work at that trade?

Mr. PERRETTE. Well, sir, I would have to go into detail to say that.

Senator NEW. No; just briefly.

Mr. PERRETTE. I started my trade as a cutler in Titusville, Pa. The cutlery trade involves a certain percentage of machine work and through what we call booming—that is, not serving your length of time you are supposed to serve at the machinist trade—you gain more knowledge than by staying at one place when you boom. By booming you gain knowledge of this plant and that plant and the other one, and you can combine them together. You get a certain line of work at one that you would not at the other, where if, maybe, you stay at the first plant it would take years to accomplish what you would get in a very short period of time at the next plant.

The CHAIRMAN. In short, you have gained your knowledge of mechanics through your business and trade?

Mr. PERRETTE. At different plants.

The CHAIRMAN. Engaged in the manufacture of cutlery?

Mr. PERRETTE. Yes, sir.

Senator NEW. In your present capacity, as an inspector for the Government at the Willys-Morrow plant, have you noticed any practices that you think detrimental to the interest of the Government?

Mr. PERRETTE. I have.

Senator NEW. What, for instance?

Mr. PERRETTE. Well, there seems to be—first, I will say from my experience as a foreman of inspection—I will relate an incident. On a certain evening one of my men called Mr. Rowley's, an Army inspector, attention to a defect in a case, I will say, to this effect. that there was one main bearing stud that was 62/1000 oversize and would have gotten by the Army inspection if his attention had not been called to it by the company inspector. The night foreman of that department—I did not know it at the time it happened—but the night foreman of that department called my attention to the fact that the Willys-Morrow inspector was not allowed to call the attention of an Army inspector to any defects whatever in a case or product of any kind, and he advised me to go down and call this Willys-Morrow Co. inspector down for this act. I did not really want to do it; but I had to do it. I went down and told him not to do it again, and the next morning when the day foreman comes on the night foreman informs the day foreman that my man had done this, and the day foreman, who is in charge also of the night foreman—that is, he has charge of the department—I came under him. Well, the day foreman tells the day foreman of inspection, understand me, that this had been pulled off and that I was to blame, or that my man was to blame; then I received a call down from the day inspection foreman that such stuff was not to be pulled off, not to do it any more, and for me to call this man down again that night about it, which I did not do.

Senator NEW. You were then working for the company?

Mr. PERRETTE. For the Willys-Morrow Co. as foreman.

Senator NEW. You say the foreman—that the employees of the Willys-Morrow Co., the inspectors, were not permitted to report

defects to the inspectors representing the United States Government there?

Mr. PERRETTE. Yes, sir.

Senator NEW. That was a practice and a rule?

Mr. PERRETTE. That was a practice—I will say a practice—I do not know as it was a rule. It was not allowed anyway.

Senator NEW. Were there any other instances of that or of a similar character that you have in mind?

Mr. PERRETTE. Well, the night inspection foreman informed me that if an Army inspector can not get along with the Willys-Morrow inspector, that the Army man is reported to some particular party here at Washington, D. C., and his transfer to some other station is conveyed to the senior inspector at the Willys-Morrow Co.

Senator NEW. Who was it gave you that information?

Mr. PERRETTE. I do not recall the man's name, but his first name is Ed. I can get you his name when I return and mail it to you.

Senator NEW. I wish you would give that name for the record. Did he tell you who the officer was here to whom the United States inspector was reported?

Mr. PERRETTE. He did not, but it is rumored around the plant and also in the Army inspection room—we have a room there supplied us in a building there for our use for a lounging room, and when we congregate there it is rumored around and almost known to be a fact that some certain man who used to be efficiency engineer, I think, for the Willys-Morrow Co. had received a commission as major at Washington, D. C., in charge of the employing of Army inspectors for the Signal Corps. I do not know that to be a fact, understand, but that is the rumor.

The CHAIRMAN. Can you give us the name of the officer?

Mr. PERRETTE. I have heard that his name was Sheppler or Shappler.

Further. I will say, on May 26, there were eight water pump bodies that had been welded and some sprayed. Those were submitted to me for inspection in the Army inspection room, and, being well acquainted with the casting, I noticed a sort of eruption on the water pipe, and by taking an instrument I picked that right off, and it showed that there had been a sand hole there and that it had been filled up with this spray.

The CHAIRMAN. What is a water pump body?

Mr. PERRETTE. A water pump body is part of a water pump assembly that transmits the water from the radiator to the motor.

The CHAIRMAN. How many of those did you find that were defective?

Mr. PERRETTE. Eight, sir.

The CHAIRMAN. What did you do with them?

Mr. PERRETTE. I rejected them and called the attention of the foreman of that room to them, and he held them over for consultation with the chief inspector. Otherwise I do not know what became of them.

Senator NEW. A sand hole in that body would indicate a leak?

Mr. PERRETTE. Yes.

Senator NEW. And it was for that reason that you rejected them, was it?

Mr. PERRETTE. Yes, sir.

Senator NEW. You say you have no idea what became of them after that rejection?

Mr. PERRETTE. No, sir.

The CHAIRMAN. Did you have the authority, when you once rejected the part of an engine, to see that that part was not used, or to see——

Mr. PERRETTE. We have no authority to mutilate any product whatever. It is against the laws of the United States to mutilate any Government property.

The CHAIRMAN. It is not Government property until it is received: you inspect it before the Government accepts it, do you not?

Mr. PERRETTE. Absolutely; yes. I see what you mean now. But, nevertheless, we have no right——

The CHAIRMAN. That may be.

Mr. PERRETTE. I think it is an agreement between the senior inspector at that plant and the Willys-Morrow Co. that no rejection can be mutilated.

The CHAIRMAN. You make your report to the senior inspector?

Mr. PERRETTE. I make my report to the foreman of the department, which, in turn, goes to the senior inspector.

Senator NEW. You say they had been passed by the company inspector?

Mr. PERRETTE. Yes, sir.

The CHAIRMAN. Who is senior Government inspector?

Mr. PERRETTE. Mr. Bissell. Another thing, I know this to be a fact, because at the time I accepted this position as the Willys-Morrow foreman of inspection, they were about to remove the man that had that job, and I asked why they were letting him go, and they said he did not use his head and was holding up production, and after I had been placed on the job I inquired about this man, and it is said that even after, in one certain instance, even after this Army inspector on duty had passed a case, this fellow at one time had gone around, even after the Army inspector, and held that case.

Senator NEW. Is it the practice to stamp articles approved or rejected?

Mr. PERRETTE. Yes, sir; our official rejection stamp is a number in a circle, and the official acceptance stamp is a number in a square.

Senator NEW. It has been stated to me that in some instances parts that have not been stamped have been transferred to assemblies which had never had Government inspection.

Mr. PERRETTE. On coming to work May 25 there was an argument in the Army inspection room about some O. X. 6 pins that were found undersize on the assembly floor that had never received Army inspection. Those parts can not be stamped because they are hardened ground, and it would be detrimental to stamp them.

Senator NEW. They were undersize?

Mr. PERRETTE. Yes.

Senator NEW. What about the effect of using that undersized pin, the possible effect of it?

Mr. PERRETTE. Well, it would cause a knock in your motor, and eventually would wear in a shorter space of time than it should.

Senator NEW. Were there any other instances of that kind of which you know?

Mr. PERRETTE. No; not any I can recall at present.

Senator NEW. Do the company inspectors there scrap defective work?

Mr. PERRETTE. On Thursday, June 6, R. F. George, employment No. 9100, a Willys-Morrow inspector, when asked by me if he ever scrapped any defective work, replied that he would be called down for it if he did and that he did not have any rejection stamp. We were at that time working on center cam bearings, product No. 40344. His orders from the foreman were to let Army inspectors pass on work.

The CHAIRMAN. You say he had no rejection stamp. Do you know whether any of the other company inspectors had such a stamp?

Mr. PERRETTE. They are not supplied with them.

The CHAIRMAN. And the company does not use the rejection stamp at all?

Mr. PERRETTE. No, sir.

The CHAIRMAN. Do they use an approval stamp?

Mr. PERRETTE. Yes; but not an approval stamp on small parts. All other plants I have worked at the inspector had an individual stamp. Last Sunday—I mean a week ago yesterday—five pieces of intake push-rod yokes, product No. 41593, bore evidence of having had rejection stamps ground off. I submitted those parts to the foreman of inspection, and he readily conceded the same as I—that the stamp had been ground off.

The CHAIRMAN. Did you report that to the chief of inspectors?

Mr. PERRETTE. I have nothing to do with that. I take mine up with the foreman of that department, and he in turn takes it up with the senior inspector. We can not go direct.

The CHAIRMAN. You reported it to the foreman, did you?

Mr. PERRETTE. I reported it to the foreman; oh, yes.

Senator NEW. You do not know whether he carried it any further or not?

Mr. PERRETTE. I do not know what happened.

The CHAIRMAN. What was his name?

Mr. PERROTTE. The senior inspector?

The CHAIRMAN. The inspector to whom you report—the foreman?

Mr. PERRETTE. Dan Dalrymple, a mighty fine man and on the square if he could be.

The CHAIRMAN. Then it is fair to assume that he reported this to the senior inspector?

Mr. PERRETTE. Oh, yes; indeed, he did.

Senator NEW. Did you ever scrap any large number of pieces of defective products?

Mr. PERRETTE. Yes, sir; of products No. 41619, exhaust rocker arms were rejected and were returned to Willys-Morrow inspection. The reamed hole size 0.3735–0.374, for the hole being bell-mouthed, over-size and not round. There were 680 pieces.

Senator NEW. It is, of course, understood that there are defective pieces in all kinds of manufacture?

Mr. PERRETTE. Absolutely.

Senator NEW. Metals, woods, or of whatever material. The important fact to establish is that these defective parts are rejected as such or that a systematic effort is made to prevent the rejection of such

parts. Do you think that there is at the Willys-Morrow plant something of a systematic effort to get those defective pieces passed by the inspectors?

Mr. PERRETTE. Past the Army inspectors?

Senator NEW. Past the Army inspectors.

Mr. PERRETTE. Well, there seems to be a case of getting it by if possible. Let me cite you this: K-211 magneto brake stud, 3,000 were rejected for the first two or three threads being stripped. The same pan was returned to the Army inspection room three times on three separate days.

Senator NEW. You mean it was once rejected and sent back?

Mr. PERRETTE. Yes, sir.

Senator NEW. Was again rejected and a second time came back?

Mr. PERRETTE. Yes, sir.

Senator NEW. And was a third time rejected and again came back?

Mr. PERRETTE. And again came back. That last time they came into the Army inspection room and the studs had been inspected and there was a very small amount that were accepted by the Willys-Morrow Co. and submitted to us for inspection again.

The CHAIRMAN. What was the date of that?

Mr. PERRETTE. I have not got that date down, but it is on the report in the senior inspector's office. It must be.

We have had products come into the Army inspection room that have been previously rejected, but in regular production stock—you see what I mean?

Senator NEW. Yes.

Mr. PERRETTE. Supposing to-day that we rejected 25 or 30 pieces, to-morrow possibly two or three of those pieces would come through on regular production stock. Those parts have got a rejection stamp on them and we have found them and the rejection has been previously rejected, regardless of who the Army man was who previously rejected them. We back one another up in that way. Then in case of any controversy it comes up between the superintendent of inspection of the Willys-Morrow Co. and the senior inspector of the Army.

Senator NEW. They could not find their way back a second time that way except by the studied effort of somebody to put them through regardless of the rejection, is that it?

Mr. PERRETTE. To get them by.

Senator NEW. And your answer to that is yes?

Mr. PERRETTE. They must have been put through by somebody's efforts; yes.

Senator NEW. Would it be possible for you to give this committee samples of some of those defective parts?

Mr. PERRETTE. I can not do so unless I have the proper authority. I can not remove any product from the Willys-Morrow Co. unless I put myself in a very peculiar predicament that they could serve notice on me and have me arrested.

Senator NEW. I understand, of course, that you as an individual have no right to appropriate those parts or to carry them away, but you know that those parts are there and available?

Mr. PERRETTE. Provided they have not been removed.

Senator NEW. And could be produced before this committee by order from the proper authority?

Mr. PERRETTE. Yes, sir.

Senator NEW. Who would be the nearest authority having the right to issue such an order, the nearest authority available to you as an inspector at the plant?

Mr. PERRETTE. I think that would have to come under the Department of Justice, would it not, for me to take any product out of that plant?

The CHAIRMAN. That is all a matter of guesswork. I should imagine, however, it would come from the Bureau of Aircraft Production.

Senator NEW. Is there anything else that you know of that ought to be made known to this committee?

Mr. PERRETTE. From my observation it looks very much as though the production department and the inspection department of the Willys-Morrow Co. were hand in hand. The inspection department does not seem to be allowed to hold up production, and from a previous fact in this statement, as before related, that a Willys-Morrow man is removed if he does.

(Whereupon, at 1.30 p. m. the subcommittee adjourned until Wednesday, July 10, 1918, at 10 o'clock a. m.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JULY 10, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10.30 o'clock a. m., in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MAJ. CUSHMAN A. RICE—Resumed.

Senator REED. You have in your possession a table showing the performance of the various engines and planes used in England, which you have stated to us is in part confidential, but you will make application for a release of a part of it?

Maj. RICE. I think I can give you a release of the whole of it by taking it down and showing it to Gen. Kenley or Col. Arnold and saying you gentlemen want it. They are desirous to please and aid your committee in every way.

Senator REED. If you can get the release, either for the use of the members of the committee, to be treated by them as confidential.

Maj. RICE. Since I have been with you gentlemen the last three days I am firmly convinced that your knowledge of the subject of aviation is surprisingly broad and that you have gone into it quite deeply. In talking last night with Gen. Kenley I brought up the subject and stated that I thought your committee are getting in a great deal closer touch with the air service now, and appreciating the fact that despite mistakes a great work has been done, and that this would be of great advantage to both the Committee on Military Affairs and to the air service. I believe you will have no difficulty in getting Gen. Kenley or his department to give you any information you gentlemen want, but for me to give you a table of this sort I must have my superior's permission.

Senator REED. With the understanding that we have about this tabulation for the general record I want to ask just a very few questions.

In your opinion is the Hispano-Suiza engine a good workable type of engine?

Maj. RICE. Yes, sir; it is a very satisfactory engine, both the old type and the new Viper Hispano is giving very good service in the planes the English are using them in.

Senator REED. What is that?

Maj. RICE. The Viper Hispano Suiza is a new type. I think they have them listed here in this table.

Senator REED. They are using them on the S. E. 5?

Maj. RICE. Yes, sir.

Senator REED. The power of that engine is——

Maj. RICE. That is the new one, the old S. E. 5 carried the 150 R. A. F., and the 200 Suiza.

Senator REED. But the Viper Hispano is what power?

Maj. RICE. It is about 220 horsepower, I think. The power is not given in this tabulation.

Senator REED. Now, the Le Rhone, is that regarded as a good engine?

Maj. RICE. Oh, yes.

Senator REED. And the Rolls-Royce?

Maj. RICE. The Rolls-Royce is about the best stationary engine that I have seen operated, in my opinion.

Senator REED. The best stationary engine?

Maj. RICE. That is, fixed engine; not a rotary.

Senator REED. So that in your opinion the two types of engines that are best for general use, that the English are using, are the Hispano-Suiza and the Rolls-Royce?

Maj. RICE. Yes, sir; but they also get very good results from the Beardmore motor, the Siddeley, the Galloway, and the R. A. F.

Senator REED. Has that been in use for some years?

Maj. RICE. Yes; the Beardmore is used a great deal for their big machines. They have a new motor, the Eagle Royce, that they are using in the big new Handley-Pages. They use four of them. They are about 350 horsepower each. It is a new type of Rolls-Royce, called the Eagle Royce. It is hardly listed in any of the tabulation sheets being very newly out, but it is giving great success. The old Handley-Page carried 275-horsepower standard Rolls-Royce motors.

Senator REED. I think we have been over this. You, in all your experience on the front, did not have any experience with the Liberty motor?

Maj. RICE. No, sir; I flew in the machine equipped with the first Liberty motor built in America, and I have never seen one since.

Senator REED. You flew that one in America?

Maj. RICE. Yes, sir; in November with Blakley, who was then experimenting with it, at No. 2 field, Mineola. May I volunteer one little statement about that motor?

Senator REED. Yes.

Maj. RICE. This was an 8-cylinder, 225-horsepower Liberty motor, and in my opinion it was a pretty good motor. I understand the Liberty is—this is of course only hearsay, but I understand they are going back somewhat to the type of that first motor, but with 12 cylinders. I do not know whether that is so or not, but men who do know tell me this new motor is working back to the old one in the matter of the oil systems and several other things, features that were part of that 8-cylinder Liberty motor. The 250-horsepower Liberty would have been a good motor to have flown in the Bristol scout. It gave a good pull and seemed to have plenty of snap and life in it. This was the first Liberty motor flown in an aeroplane in America.

Senator REED. In your opinion is it practical to have one type of motor for all the different types of machines that are used?

Maj. RICE. To me it is inconceivable that it could be done. I do not think it is possible for any one motor of a fixed horsepower in the world to be capable of all flying that is needed on the front, to be installed in all the different types of machines, because a big horsepower motor used in a large bombing plane if put in a little, small fighting machine would pull it to pieces.

Senator REED. Then its weight counts?

Maj. RICE. Its weight, power, gas consumption, and everything else.

Senator NEW. May I ask a question at this point?

Senator REED. Certainly.

Senator NEW. First, you have said, Major, that no one type of engine is suitable for general adoption in all types of planes?

Maj. RICE. No, sir; I did not say type, but one horsepower and weight. I did not quite make that statement, because one type of motor but of different horsepowers might be. A 450-horsepower Liberty motor might be suitable for all general types of work of a certain class, such as bombing and certain types of reconnoissance planes, but would not fly a speed scout, but a 200-motor Liberty type would, but it might carry all the heavy type of machines and give great service. While the same type of motor reduced in weight and horsepower might prove a great success in scout and fighting machines.

Senator NEW. Perhaps I did not make my question clear. What I wanted to get at is this: The Bristol fighter is a light type of machine?

Maj. RICE. Medium.

Senator NEW. And was originally designed to carry a Rolls-Royce motor?

Maj. RICE. Yes, sir; a 190-horsepower motor, weighing about 450 pounds, or a 200-horsepower Hispano-Suiza of about same weight. If you put a Liberty 450-horsepower motor weighing about 800 pounds in it you would have to change entirely the construction of the plane.

Senator NEW. Does not the substitution of a 824-pound engine, which the Liberty motor is, and of 450 horsepower so completely change the balance of the plane as to render it dangerous?

Maj. RICE. You would practically have to design a new type of plane. Then there are much smaller machines, you know, than the Bristol fighter. The Bristol fighter is an intermediate size. You get a machine, for instance, like the Sopwith-Camel, which has a high climbing altitude of 24,000 feet; you could not begin to put an 800-pound 450-horsepower motor in any Sopwith-Camel as it stands on the fields of France to-day. You might rebuild that type of machine absolutely or increase it and get the size and strength necessary to carry that motor, but the chances are then you would reduce its speed greatly. Again, you might reduce the weight and horsepower of the motor to fit the Camel without changing the type of motor and meet with good success.

Senator NEW. Apart from the item of weight and considering the vibration caused by the increased horsepower, the Bristol plane, for instance, is originally designed to withstand the vibration caused by an engine of 190 horsepower?

Maj. RICE. Yes, sir.

Senator NEW. Now, to put in that a motor generating 400 horsepower subjects the structural parts of that machine to a greatly increased vibration, does it not?

Senator REED. You mean vibration or strain?

Senator NEW. Well, strain.

Maj. RICE. It is not vibration so much. If properly built, it should not vibrate a great deal.

Senator NEW. Let us say strain.

Maj. RICE. In the carrying weight the wings have to carry a certain amount of weight, and in a fighting machine speed is the great essential. These Bristol fighters you speak of are designed to carry a 190-horsepower Rolls-Royce; also they use a 200-horsepower Hispano-Suiza.

Senator NEW. Those two engines being of relatively the same weight?

Maj. RICE. Practically the same weight, type, and horsepower. Now, if you enlarge that tremendously——

Senator NEW. Which is done by substituting the Liberty motor by either the Rolls-Royce or the Hispano-Suiza?

Maj. RICE. As I understand, the Liberty motor is 450 horsepower and 820 pounds weight?

Senator NEW. It is over 400 horsepower and 820 pounds weight.

Maj. RICE. I would not, myself, like to be the first one to fly that machine. I would not care to make the experiment, if no change had been made in the plane.

Senator REED. Let me put it in another way: If, in designing a plane, it is calculated to make it strong enough to bear the stress or pressure upon the wings, and that depends upon the weight that must be carried and the speed at which the machine flies, does it not?

Maj. RICE. Yes, sir. In designing any aeroplane to-day for fighting purposes, strength enough to keep it from breaking up is imperative; speed as high as it can be developed is also imperative; and in the development of speed you reduce wing surface, lift, and all that to a minimum. You work on that minimum, and you put all the horsepower you can in it, and it will carry so much weight under these given conditions, and very little more, with safety.

Senator REED. That is, at a certain speed?

Maj. RICE. At a certain speed. But if you increase the wing surface without very materially increasing the engine—the horsepower—you are reducing the speed of the machine a great deal; while, if you go to work and add to the weight of its load, you also reduce the safety of the machine, and if you increase it enough she will not fly except at the extremest speeds, and that means you can not land the machine except at full speed.

Senator REED. Let us say that a machine is built strong enough to carry a 400-pound motor and fly at a maximum of 125 miles an hour, which, I understand, is about the weight of the engine and the speed that was expected to be developed and was developed in the Bristol fighter. Now, the fuselage and the wings are made just strong enough, plus a factor of safety, to carry that engine?

Maj. RICE. Yes, sir; just large enough.

Senator REED. And large enough—strong enough and large enough to carry that engine at that rate of speed and withstand that pressure. That is true, is it not?

Maj. RICE. Yes, sir.

Senator REED. Now, if you double the weight of the engine, making the machine carry that 400 pounds extra weight, and then put on enough additional horsepower to compel the plane to lift itself with that additional weight, that vastly increases the pressure upon the wings, does it not?

Maj. RICE. Yes, sir; you have got to decrease the military load you carry somewhere.

Senator REED. I am assuming they carry the military load. Then if you put additional pressure on, then this great powerful engine is liable to destroy the machine, to break the machine to pieces, is it not?

Maj. RICE. You have to increase the strength.

Senator REED. I am assuming you do not increase the strength. It means death to the aviator, does it not?

Maj. RICE. It depends on how much of a factor of safety that machine was built with, but it does mean this: It means the aviator will have to land at greatly increased speed, and landing is the most dangerous part of flying.

Senator REED. That is a matter of landing, but how about the machine itself?

Maj. RICE. Because if he does not land at that great speed, as soon as he slows down he falls out of the air.

Senator REED. If you take an ordinary Bristol fighting machine, built to carry the Hispano-Suiza 200-horsepower engine, and weighing approximately 400 pounds, built just strong enough to carry that with an ordinary factor of safety, and you put in an engine twice as powerful, and which weighs twice as much, and then put the necessary pressure on to fly, is it not liable to break that machine up in the air and to make some part give way and have accidents?

Maj. RICE. Well, I am not technical enough to absolutely give you a positive statement on that, but I can say this much, I would not want to do the experimenting or to be the first one that went up.

Senator REED. That is a sufficient answer.

The CHAIRMAN. That is about the best answer you can make.

Senator REED. I wish you would tell us in your own way how the machines on the front now operate in the matter of bombing. Of course, if there is anything confidential about this you can save it.

Maj. RICE. No; I do not see that there is. Also, this is an executive session. After the permission your committee received from the Secretary of War for me to appear and testify before you, I do not feel that there is anything improper in my answering your question. In other words, I think it is safe to take it for granted that you gentlemen are as patriotic as any of our young officers who are operating and working in our machines at the front.

Senator REED. I will ask that this be withheld from the print unless we get instructions otherwise, but the reporter will give us a transcript of it.

Let us take up the bombing operations.

Maj. RICE. You mean in regard to machines or in regard to the methods they operate?

Senator REED. I wish you would just tell us what they are doing over there in the way of bombing, the kind of machines used.

Maj. RICE. I have not operated bombing machines, but I have been interested, and have gone down to different British squadrons and talked to them and made a couple of night flights. The bombing as done is done with the D. H. 4's, F. E. 2, Handley-Pages, and other machines—I have never been out with a big Handley-Page. They load up with their bombs in the evening and fly by map and compass as near as they can tell to the place they wish to bomb. They locate their object over the German line, which will be probably an ammunition dump at a certain rail head, maybe several kilometers back of the line. Now, those flights are generally more safely made in a flight of about six machines. Six machines is the most convenient method of handling aeroplanes that we have found. The flight commander flies in the front and can, by means of various light signals, control his flight better than any other unit that we have found, and six are strong enough generally to put up a very good fight in case they are attacked.

When they locate a given area that they are going to bomb the flight commander will probably fly over that area followed by his flight to be sure of his location, then he will signal for his men to stand in close with him, and when he goes over his chosen area he gives the signal with a very light gun: it is fired in a cartridge from a revolver, and is about an eight-gauge cartridge in a little short revolver that looks like an old fashioned blunderbuss, and this thing is fired usually upward—that is the correct way to fire it—so that the men in the other planes can see it go up and as it comes down. If you fire below you are likely to get below the edge of the planes, and flying in a flight where planes are not over 50 yards apart, with six machines, the pilots may miss seeing signal if fired downward.

I was very proud once of having some men trained so they could fly about 25 yards apart, and that is rather unusual. It makes you safer the closer you fly. Then you can handle them easily.

You may signal with this pistol to drop one or two bombs in a series, or you may signal, as they often do, especially when it is a dark night and it is hard to locate the place to be bombed, for them to, as we call it, pull the plug; that is, to let loose all your bombs, and it makes it very unpleasant for anybody who happens to be under it, because they fall in close sections. The Germans dropped some on us one night, and they fell along in about 6 feet areas; they were released all at once from a Gotha, and judging the effect of our bombs, which we claim are at the present time stronger than the Germans from the havoc raised by these German bombs, we must be doing a great deal of damage every time we bomb them, because when they bomb us they surely tear things up tremendously.

I have seen a house in Amiens, a three-story brick, good sized house, hit with, I judge, about a 100 or 80 pound bomb, which was delayed in its firing. They have a firing fuse that is delayed a few seconds to allow them to penetrate. The entire house, with the exception of one little jagged corner of brick, was gone; material—and everything else disappeared.

The CHAIRMAN. Just from one bomb?

Maj. RICE. I believe from one bomb, though it might have been a cluster. The materials, the beams, the bricks, and all had been blown away. I happened to be in front of the house but across a

wide street and was blown clear over into a park by the force of the explosion.

The report of the latest big German bomb we had is that they have a 600-pound 7 foot 3 inch bomb. If they ever drop them anywhere in the immediate neighborhood I do not think I would want to be anywhere near it, if it has the same proportionate strength as the 30-pound bombs. The average bomb they use over there is about 25 or 30 pounds; it is like a turnip in form and its detonating head is in the front; it has a series of flanges along the side, and it carries on it a little three-bladed propeller, and when you drop the bomb it trips out of your frame carrier under your machine. There is a hanger for tripping it; it turns over and this propeller starts winding as soon as the bomb starts falling. This is a safety device. It is generally set so the bomb has to fall about 200 feet before the winding of the propeller cocks the firing pin and releases the hammer that will fire the concussion head when it strikes. That is done for safety. For instance, the machine lands, and when the pilot comes in we will say he makes a bad landing. He may be wounded or partly out of control and he comes down to the ground very hard, and smashes himself and his machine up, and it would be rather unpleasant for him if he had six or seven bombs under him that would go off on contact. I will admit that I have given machines which once or twice I have seen coming down badly out of control pretty generous room to land in because everybody is a little bit suspicious that the bombs might detonate. Were it not for this control they would all go off. That is a safety precaution. Since that has been devised we have had very few accidents in handling bombs. Before that the men handling them would get very careless with them and we have had them explode, and they were very dangerous to us as well as to the enemy. Now they can handle them almost indiscriminately.

Senator REED. To what extent are they using the bombing machines in battle compared with what they did say a year ago?

Maj. RICE. They use them to a great extent. The British in the last two big attacks flew in flights and attacked troops right on the front.

Senator REED. Did they do good execution with them?

Maj. RICE. They reported its being very, very successful. Based on my experience of being in an English line of trenches with the British artillery outfit when two German planes came down on us and the effect it had on me and the rest of them, I think it probably had a tremendous effect on the enemy, because I know that most of us got out temporarily. The psychological effect of this method of attack is very, very much greater than anything that I know of in war. To have somebody come swooping down on you, right over your head like a great hawk, and his machine guns all operating at once—he generally mounts three of them—and just for a little variation dropping these 25-pound bombs on you, it makes you feel, even when you are in a great fight, where the machine guns are burning you up and the big artillery shells are falling, and everything—well, you do not like it. I am absolutely convinced that it is the greatest weapon that is now open to us for quick results against the Germans.

The CHAIRMAN. And to the other people also?

Maj. RICE. Oh, yes.

Senator REED. You think, then, if I get your last expression, that perhaps the most important thing is to get immediately a large number of capable fighting machines on the front?

Maj. RICE. It is my actual opinion that at the present time we can accomplish more by getting aeroplanes in great numbers than in any other way; getting them for scouting, fighting, bombing, and machine-gun strafing. If we have enough of them so we can be quite prodigal with them, and so that we do not have to be careful of our machines for fear of losing control of the air—if we have them so we can use them like you do the Ford jitneys, shoot them in anywhere—it will have the tendency of keeping the Germans underground anyhow. Neither will his transport be free to move about at will, and high explosive can be dropped on him at all times.

Of course there is one thing in aeronautics we shall have to admit. The science of bombing, though it has gone on and improved wonderfully, though we have men who are quite expert at it, is not like direct artillery or map shooting, because we have not been able to make absolutely certain hits with bombing.

Senator REED. Can you not get over a town and do fearful execution?

Maj. RICE. We can do terrible execution in a town, but we are not able, except by more or less luck, to pick the building we want with any great certainty from heights.

I can fly over this town at the present time and do great havoc. I can take a squadron and have an airdome back somewhere, say the line is across the river, so I can go back and forth and load up with bombs quickly, and in two or three days I can do terrible destruction in Washington, drive everybody out of it, but I may miss the Capitol Building, though I may be bombing at it all the time; but I am going to hit something close to it. Of course, you see, I must stay up very high. If I get down within 4,500 feet I am within the machine-gun barrage, and no aviator likes to fly in a machine-gun barrage. Any aviator on the front—that is, a fighting aviator—does not worry a great deal about the Archies (the antiaircraft guns), because they do not bring so many machines down; but when you get down low into a machine-gun barrage you have 7,000 or 8,000 of these bullets spattering at you a minute, and they are generally in plants of a number of machine guns, in a section using these tracers, so if they shoot to the right or the left of you all they have to do is to correct their shooting by the trail of the tracer. It does not give an aeroplane any great chance to get through. I have seen them go through it, but in bombing that usually causes one to stay up pretty high. If you have flown in a machine, as you gentlemen no doubt have, you know when you get a couple hundred feet up the buildings get small and the people get to be little tiny bits of things. Now, you add to that and go over 10,000 feet.

Senator NEW. You can not distinguish people on the ground at all: you can not see people there?

Maj. RICE. No: not if you are high enough up.

Senator REED. Dayton, Ohio, at that altitude, is about as big as Sioux City Block, and it is a town of about 175,000 people, I think.

Maj. RICE. Yes; you read in the papers accounts of bombing experiments at 7,000 and 8,000 feet of aviators dropping oranges on the whitewashed design of a battleship and the scores given as perfect if they hit inside of rings representing the smokestacks, and some one aviator makes all but one or a perfect score. He is lucky, usually in a small aviation field, to hit the field at that distance if he is high enough up. But if, for instance, using the Capitol as an example, they started bombing here and everybody were trying for it, they would make it mighty uncomfortable to stay around.

Senator REED. Have you any formal suggestions to make as to the type of machine that you think ought to be put on the fighting front, or any other suggestions based on your experience over there in regard to aeroplanes, the aviation?

Maj. RICE. As far as the aeroplane is concerned, I believe that almost any good designer who has studied aviation—there are men in the Army and there are quite a number of civilians here who are good designers—one, a man by the name of, I think, Chance Voigt, of New York. I saw a machine last year he had designed that looked very promising. Also a fighting machine designed by a man named Berckman was very good, and other men the same way. When I was at Mineola they brought a great many of these experimental machines to a field down below Mineola, about 6 miles away, called the L. W. F. Field: they had a great many experimental machines there owned by individuals. Some of them were just cranks, you know; they built machines that it was unsafe to take your picture in. I used to go down there a great deal with Bert Acosta, the chief tester for the Government, and we flew in a great many different types of machines, and some of them had a good deal of merit to them, especially the Berckman scout.

Senator REED. I am asking you if you have any suggestion as to anything that ought to be done to improve our aviation service on the front, except what you have already stated, that we need a lot of new machines?

Maj. RICE. You mean of recognizing a known type of machine if we do not develop anything new?

Senator REED. Yes.

Maj. RICE. My idea really is they ought to get these good designers, who have designed machines here, and have them design machines like the Spad, the S E 5, the Sopwith Camel, the D H 4, the Bristol fighter, and the Handy Page. There are a lot of American designers—I could name a dozen—who have designed pretty good stuff, and if they got a little encouragement from the Government they might bring out something that would be a little snappier and quicker than what they have on the front. As to the machines the British now have, I think it is practically safe for us to build any one of the machines they are using regularly and equipping their armies with, because they have been four years in the war; they have got some mighty good mechanical geniuses with them. I can bring you tomorrow a table of the performances of machines that are actually flying on the front.

Senator NEW. Does not this table give it?

Maj. RICE. No; some of those are not being used now. But a list I have shows them all. Any one of those machines, in my opinion,

will give good results. The Spad and other French machines also give very good results. I have seen them in operation. The Breguet gives good results. Those are the only two French machines that I have seen much of. I like them very much. The Nieuport I have seen in operation, but I do not care for it as much as other types. It is good, but it has two or three defects, in my opinion.

Senator REED. How many machines now, can you tell us, are the British and French able to keep on the front in actual work?

Maj. RICE. I am not able to tell you that. I think I have data enough to furnish it, but I can not make a direct statement on that at this time, and would not like to do so without first consulting my superiors; also getting permission from the representative of the Royal Air Force in this country.

Senator REED. If you can figure it out, I wish you would, and insert it at this point.

How many machines do you think we could use over there provided there was, we will say, six months' time given for the training of aviators, etc.?

Maj. RICE. We have got a good many aviators that are at least preliminarily trained that need only a little extra work to put them in fighting shape, and the personnel is in good shape. We have got some men in France ready to go right out on the battle front: others may need a short period of training in the fighting planes. There are a great number who have taken their preliminary training and need only a few weeks advanced training. We also have a good many officers who have been trained with the British who have taken their full advanced training and are now fighting on the front. Col. Kilner, who is in charge of all our training fields in France, is one of the most efficient officers in the service, and with the officers that we turn out in this country he will keep the supply of officers up, no matter how many planes we have.

Senator REED. So you think, as far as the personnel is concerned, it can be taken care of?

Maj. RICE. Oh, yes. It is in excellent hands.

Senator REED. Of course, there is, in addition to that question, the balancing of forces; it must not all be aeroplane forces. In your opinion how many planes ought we to try to put on the front within the next six months?

Maj. RICE. Well, the more machines that we put on, and the sooner we get them on, the more we are going to help any offensive, and the stronger we are going to be on the defensive, but I believe that we could handle very well, indeed, and do good work, if we got four or five thousand machines in the next six months; that it would be about what we could handle with aviators or fliers, enlisted personnel, and everything of that sort. Later on I think we should have about 10,000 machines, and we should be in a position to keep that many or more in the air throughout the war. Of course, that will be gauged a good deal on what our enemy does. If he is wiped down to such an extent that we can do all our work with a much less number of machines, of course we do not need that many, but there is no getting around it that we will have absolute use for them working with the Infantry and Artillery and other branches of the service. Twenty thousand machines in a year or so from now should be our aim.

Absolutely; the more that we have the better off we are. An aeroplane is like a motor car; you don't have to use it just because you have it.

Senator REED. When did you leave the front?

Maj. RICE. I left the active firing front as late as June 16, I think; I was under fire the last time on June 16, because we went into Paris the day after and celebrated the stopping of the Boche drive. I went in with several officers, and we had quite a little party over the fact that it was the end of the Compeigne drive and the Germans had quit.

Senator NEW. At that time what experience had you had with American-built combat planes?

Maj. RICE. I had never flown in American combat planes. I had handled training machines. I had charge of the advanced training planes.

Senator NEW. Had you seen any American combat planes on the western front up to that time?

Maj. RICE. No, sir; but I was not in a position to have seen them, except if I went visiting, because they were not used on our front. On a contract between the United States Government and the British Government we supplied a certain number of aviation units (personnel) to the British practically loaned the men to them.

Senator NEW. Men and not machines?

Maj. RICE. Not machines, men. And they equipped these units with British engines and British equipment on the contract that on so many months' notice we can take these men back and turn back equipment to them.

Senator NEW. I understand and know of that arrangement, but I wanted to know from you if you had had any experience, or if you knew of any American combat planes on the western front as late as the 17th of June?

Maj. RICE. No, sir. I was not on duty with the American troops, and I have never seen any. I have heard of Liberty motors being at two of the fields, because officers who were under me reported having seen them. These were at two of the fields in the back area.

Senator NEW. There were, I think, 13 of them delivered to France something less than a month ago. I mean, there was a total of 13 delivered there up to about a month ago.

Maj. RICE. I saw some at the port of embarkation where I embarked for the United States. The transport officer took me down—they had just come over on a steamer—and he showed me quite a number of engine boxes and told me that they were Liberty motors; they were being loaded on a train, quite a large shipment. That was about the 23d of June.

Senator NEW. No doubt they did contain Liberty motors.

Maj. RICE. That is what he said they were; they were motors for aviation purposes. I could tell that by the box and shape; but I did not see them opened. He showed them to me because he knew I would be interested. There were quite a number of these motors.

The CHAIRMAN. Where was that?

Maj. RICE. At Brest. So I imagine they are coming in at different ports all over France. I have never seen one of them operated. I am going down this afternoon to take a look at one of them. I have

heard a couple of my officers speak pretty well of the pulling power of the motor. They were out to a field near Paris and flew a machine equipped with one of the Liberty motors, and said that it was quite powerful.

The CHAIRMAN. The tests over there seem to have been more satisfactory, taken by and large, than here.

Senator NEW. I have no doubt whatever that the Liberty motor is an excellent motor. There is no doubt of that. I think it is an established fact, and I am quite glad that it is the fact; but there is a serious question in my mind as to whether the Liberty motor is suited to planes of all types, weights, characters, and purposes. It was with the idea of developing your own ideas on the basis of your personal experience that I asked the questions that I did a few moments ago.

Maj. RICE. I brought over with me five of the best flying fighters in the American service, men who served with the French or British Army—Capt. Christian Johnson, Lieuts. Frank Wells, Wilcox, Jones, all lately of the Lafayette Esquadron, and Capt. J. Kelley, late of the Royal Air Force—each one of them has been decorated by the French or British Governments. They are now in the American service. They were brought over here by order of the Chief of the Air Service, as I understand it, solely for the purpose of aiding technically. This should be of the greatest service to the builders of our aircraft. They have been sent to different fields to make suggestions on machines in the air, to fly them under battle conditions. No matter how good a man may be he does not know what is demanded on the front unless he has flown and fought on that front, and these men that came over with me have all of them brought down their Hun and are purely and simply fighting fliers, and they can step into one of these machines and will test your Liberty motor or any other motor in any plane, and in a very short time tell you whether it is fit for actual fighting service or not, and I would rather have their opinion than that of expert engineers.

Senator NEW. There have been many accidents at the various fields in the course of the training of our aviators. Have you knowledge as to the prime causes of those accidents?

Maj. RICE. I was in charge of training at a couple of fields for a short time, so I have a pretty good knowledge of it.

Senator NEW. What fields?

Maj. RICE. In charge of the advanced training at No. 1 Taliaferro Field, at Fort Worth, Tex. That is one of the biggest fields in America.

Senator NEW. When was that?

Maj. RICE. Last fall, before I went to France.

Senator NEW. Were there any fatalities among aviators while you were there?

Maj. RICE. Yes; there were quite a number of fatalities from many causes; defective materials, something wrong with the machine, and sudden wind gusts and troubles with men who have not had experience enough to keep their minds on what they were doing. They forget what their instructions have been when they get into trouble. My opinion is that the great majority of accidents are due to carelessness on the part of the pilot. A boy flies a little alone and gets a good deal of confidence in himself and becomes quite careless. There is a little period in his instruction when he really knows

very little about flying, and at that time he is surer that he is an aviator than he will be after he has got a dozen Boche on the front. When you are learning to drive an automobile there is a time when you are quite a menace to traffic; it is the same with a student aviator. I have a great belief that fatalities on a field can be eliminated to a great extent by very severe discipline. I made it a point to make my discipline extremely severe with the flying cadets and the instructors in regard to taking off and landing. Absolutely I hold them to the last letter of directions for flight and landing as given out by the T that indicates how to land. The T is a form of signal. In many fields they fly very carelessly and drop down as they please, but if you make absolutely rigid rules and punish infractions severely and make them all land in a given direction and take off in a given direction, I think that a great many, if not most, of the fatalities can be eliminated. It is like the traffic in the streets. Every aviator starting from any field is supposed to look back of him very carefully to see if anybody is coming down, because a machine coming down has the right of way at all times over other machines on the ground. When a man is coming down in a field he shuts the field out of view for a short time as he swoops down to the ground. If when he straightens out to land he sees everybody moving back and forth on the ground, it is mighty hard to pick a new landing place. Then, maybe, he is right on top of another machine on the ground. When a machine is landing my rules were always that all machines on the ground had to stop where they were. That is so that when a man is coming down in a swoop he will find the conditions the same as when he picked his landing place from higher up. That will eliminate a great deal of trouble. Do not let students get out of gliding distance of the field. Lots of the beginners get out so far that if anything happens they can not glide back to the field. They are in among fences and fields and houses. Of course, as an aviator gets more practice he can handle himself with more security in difficult places.

Senator NEW. Are any of the accidents coming under your knowledge the result of defective machines?

Maj. RICE. There were several of them that we thought were due to that cause; but usually in an accident the machine is so badly smashed up that you can not tell what is the trouble.

For instance, if the young student aviator is flying a little out of bounds, and if his engine should stop on him he is in a pretty serious predicament. He may try to keep up in the air so as to pick out a good place to land, and he may suddenly fall out of the air trying to extend his glide to a smooth piece of ground, not being practiced enough in the art of aviation so that he can tell where the factor of safety ends in a glide.

If you have a small Spad scout, for instance—the type of machine Maj. Mitchel was killed in—the glide is very slight, and you can not stay up in the air very long when your engine is gone, because it has a very small wing surface and a heavy engine.

Senator FRELINGHUYSEN. What is the situation in regard to the balance of aircraft strength?

Maj. RICE. That is a question that I am asked very often. As I say, I have been with the British. They are very strong in the air;

but it is almost impossible to draw a comparison as against the enemy. because his methods of fighting are diametrically different from ours. The German does not fly very much in the daytime, except for photographic purposes and reconnoissance. When he does fly in the daytime, he does so pretty well protected. He has probably three or four fast scouts high up above him. The Germans allow but very limited individual flying. The English will say, "We will try to get a couple of Huns," and they go up after them. The Germans keep off our side of the line to a great extent. Their patrol seldom runs over the line. They patrol over their back line. You have to cross the German barrage and meet him on the German side; then, if anything goes wrong, you have to land on German soil, and they, of course, take you prisoner, and they also get your machine. You get the idea in the daytime, after several days, watching and hunting for the Hun, that we have all the preponderance of aircraft. That there are no German machines left. Then comes some nice clear night. and all those Germans are in the air bombing everything in sight. and you would think they had a million airplanes from the way they come over you and the effect of their bombs.

Senator FRELINGHUYSEN. Do you go out to meet them at night?

Maj. RICE. There is not much use in that. You can not locate them.

The sound of an airplane comes from everywhere—all around—and you can not locate it. It is extremely difficult to do anything in chasing them, though I have seen the British go up after them often. What we do is if the German makes a long bombing raid into the interior of France, so that he returns about daylight, we look for him, and we have all the machines up in the air and give him a very rough time of it as he is returning home. He does the same with us. We do a great deal of long-range bombing into Germany. and if we do not get back before it is light the chances are that a lot of Germans will hop on us and we may lose some machines.

Senator FRELINGHUYSEN. What is the situation in regard to the counter offensive in the bombing planes over Germany? Are they preparing for the increased air raids?

Maj. RICE. The English are doing a great deal of bombing now.

Senator FRELINGHUYSEN. With the Handley-Pages?

Maj. RICE. The most of it with De Haviland 4's and F. E. 2's. but they are building many Handley-Pages for long-distance work.

Senator FRELINGHUYSEN. Do they take the Libery motors?

Maj. RICE. I do not know. All I have seen have been using British motors. I flew in the first Liberty motor equipped plane. but I have not seen them work since.

Senator FRELINGHUYSEN. What do you hear about them?

Maj. RICE. That would only be gossip. One man says it is a fine motor and somebody else may say that he does not like it.

Senator FRELINGHUYSEN. But it is a working motor and is not a failure?

Maj. RICE. There is no question in the world but what they have developed a good, strong, working motor. from what I have heard from officers who have flown it.

The CHAIRMAN. I guess that is all.

(Whereupon, the subcommittee adjourned until 10.30 o'clock a. m., July 11, 1918, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

THURSDAY, JULY 11, 1918.

UNITED STATES SENATE.
SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10.30 o'clock a. m., in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), New, Reed, and Frelinghuysen.

STATEMENT OF MR. HENRY WOODHOUSE.

Senator REED. Mr. Woodhouse, what is your connection with the Aero Club of America?

Mr. WOODHOUSE. Member of the board of governors.

Senator REED. What is your address?

Mr. WOODHOUSE. 297 Madison Avenue, New York City.

Senator REED. Mr. Woodhouse, the Aero Club of America has been giving a great deal of attention, I understand, to the question of aeronautics as applied to the war?

Mr. WOODHOUSE. Yes, sir.

Senator REED. This committee would be very glad if you will give us the benefit of any suggestions you have to make.

Mr. WOODHOUSE. The Aero Club of America was founded in 1905, and that was several years before the Army even got balloons. From that time on up until 1910 the Aero Club supplied all the balloons which were used by Army officers, and most of the Army officers now in the service in the balloon section were sportsmen connected with the Aero Club, and they all paid their own expenses to pilot balloons. Later, in 1907, when the world disbelieved that the Wrights had flown, the Aero Club, anticipating wonderful developments, offered to buy the Wright patents for \$100,000 and give them to the world as a whole and make them open to anybody. We had just raised \$60,000 to buy the Wright patents when a number of greater offers than ours came, and so we did not buy the Wright patents. They were to be given free to the world because that seemed to be the only thing that stood in the way of other inventors achieving results, because the Wrights had an idea which was very valuable and discovered the idea of controlling airplanes with ailerons, and the others did not have them. For that reason others could make straight flights, but they could not turn. They did not have this idea. So the Aero Club wanted to buy it and give it out.

Later, in the period between 1910 and 1916, when the appropriations for the Army for aeronautics were very small, and they were further insignificant from the standpoint of fostering the aeronautic art, because the Army and Navy required aircraft manufacturers to spend \$100,000 in drawings and working out specifications to get an order for \$10,000, and all the manufacturers lost money doing business with the Government, and they could not keep up their work. The Aero Club of America and the affiliated aero clubs used to spend on an average of \$500,000 to \$1,000,000 a year in aeronautics, and that kept up the aeronautic industry. In 1915, when the turn in the war began to show that the United States might be involved, or, anyhow, that it would be very wise to prepare, the Aero Club, finding that the Army could not get the officers necessary to make more aviators, because the number of married men who were willing to volunteer for the aircraft service was very small, started out to train National Guard men, which was the next best to the Army.

In the period between 1915 and 1917 we trained 300 aviators, which were eventually taken over by the Army and Navy and were the first 300 aviators to go to France as part of the Army and Navy Reserves. A number of them have died already. Col. R. C. Bolling, who was one of the administrative officers in Paris for the air service, representing the Aircraft Board, was the first man that trained at our expense. We gave him \$59,000 with which to organize a unit—an aero company for the National Guard of New York. On July 13, 1916, this company was Federalized, and thereafter they joined the aviation section, Signal Corps.

This is, briefly, what the Aero Club has done. The Aero Club has been very closely connected, of course, with the French and Italian and British air services; also the Canadian air service. In fact, we tried to help every one of the allies, and we sent a number of men to the Lafayette Flying Corps. This is purely to give you an idea of how close we have kept in touch with the development, step by step, of the air service. We have figured out a great many fundamental truths in this work in all these years. We know the problems of building aeroplanes, training aviators, and the military and naval application of aircraft thoroughly.

For instance, in the early part of 1912, when we wanted to order three airplanes making 100 miles an hour for the international aviation cup races, the first thing we were told was: "Why do you want speed? You do not need speed for any other purpose. Why do you want it for racing?"

We said: "Because some day we may have to fight a fight somewhere, and we will need all the speed we can get in airplanes." They answered: "Absurd; what do you want speed for, since for scouting all you need is 55 miles an hour."

Senator REED. Who said this?

Mr. WOODHOUSE. I dislike very much to tell you the name of the Army officer who told us this.

Senator REED. Does this officer hold an important position to-day touching the airplane work in the Army?

Mr. WOODHOUSE. He is not in a deciding capacity in airplane work. Another one who had been very much against our training

aviators at all was an officer, whose name, if you don't mind, I will withhold, and he was a close advisor of ours, and he said that a civilian would never be worth anything for war purposes, and that it would take many years of military training before he would be of any value as an aviator. So, you see, we have had all these objections brought to us, one by one. At that time we said, "Won't you need all the speed you can get in an airplane for fighting purposes?" They asked, "What are you going to fight with, your fists?" We said we would use guns and they stated that the recoil of a gun would upset the airplane.

A few months later, in May, 1912, when Col. Lewis made a test with the Lewis gun right here at College Park, and showed that the recoil of the gun would not upset the airplane. The fact is that this man who was objecting to it was speaking in terms of large guns with high muzzle velocity; therefore he was thinking of a tremendous recoil, and not thinking of using the machine gun as it is used to-day and shooting from a height or firing at another airplane. He was thinking in terms of heavy artillery, not in terms of aerial warfare as it is to-day. Likewise they said about the dropping of bombs: "Do you realize that if you drop a bomb weighing 50 pounds you will upset the airplane?" It sounded all right, and none of us dared to send up a man to drop 50 pounds' weight, because we were afraid of it, and we said, "We will have to have larger machines. In due time we will have larger machines, which will stand this weight carrying and this recoil." They said, "Don't you realize that the thickness of the wings of an airplane increase in proportion to its span, and it is plain that there comes a time when an airplane can only lift the weight of its own wings?" We said, "We will have 2, 3, or 10 motors, if necessary." They answered, "If you put two motors on an airplane and one of them stops, the airplane will spin around. Therefore having two motors to an airplane is not possible."

This gives you an idea of the great many problems that came up and why we can judge pretty well nowadays what can be done and what can not be done by what we were told could not be done and what was accomplished afterwards.

Senator REED. Now, my question was, what suggestions have you to make on the airplane service as connected with the war?

Mr. WOODHOUSE. The first suggestion, I think, is included in my letter of July 7, 1918, to Senator Thomas. That subject is of the utmost importance. That is the first suggestion.

Senator REED. Your first point is the necessity of bringing about a general understanding as to the size of the aircraft program to be carried out in 1919 and 1920. Now, we will be glad to hear what you have to say in elucidation of that point.

Mr. WOODHOUSE. I should say, in a brief way, the trouble that we are having to-day in not getting enough aircraft is due to the fact that there never was considered in making the programs the fact that it takes 40 per cent replacements per month to the number of aviators at the front.

Senator REED. Now, let me understand that. Do you mean to say that if you start in with 100 aviators on the 1st day of August that by the 1st day of September 40 of them have been killed or wounded or captured?

Mr. WOODHOUSE. No; I should say that about 15 have been killed or badly wounded and another 15 have been shocked and have to be sent to the rear, and the other 10 per cent just could not stay there for some reason or other—some of them are ill, or something else has happened to the others. Some of them purely get their nerves shattered by flying over the lines, by barrage fire, an encounter, or a hard landing, or flying at night, or flying in contact patrol. The total is usually 40 per cent per month.

Senator REED. And some would be sick?

Mr. WOODHOUSE. Yes.

Senator REED. There is a proportion in every army of men, whether on the ground or in the air, who are not well, so you count that in the 40 per cent?

Mr. WOODHOUSE. I would rather make it stronger than that. I would not count a man who has not been sent back. Figuring the number of aviators at the front and the number that have to be replaced monthly, we find that 40 per cent each month have to be replaced. In other words, I am now dealing with a total for about six months rather than purely a temporary loss of men.

Senator REED. Do you mean that 40 per cent have to be replaced each month for the six months?

Mr. WOODHOUSE. Yes.

Senator REED. So, at the end of six months 240 per cent have had to be replaced?

Mr. WOODHOUSE. Yes.

Senator REED. Now, then, that means, of course, that the disabilities of these men which you have included in the 40 per cent are not merely temporary disabilities, but disabilities that put them out of the service?

Mr. WOODHOUSE. I would not say permanent. I would say that after a man has had a shock he may stay six months back of the line in a hospital and then come back as a ground officer or observer, but no more as a flyer or kite balloon pilot.

Senator REED. What do you base that statement on?

Mr. WOODHOUSE. On the figures given by Col. Bane, of the Signal Corps, to the Senate Committee on Military Affairs on March 24, 1918, at the time of the discussion of the pay of aviators a few months ago, and also on the figures given by the French, British, and Italian aviators at different times.

Col. Bloomfield testified before your committee that in some branches of the air service, like the combat branches, the casualties are much higher. In scouting and bombing they are less. For night bombing there are more shocks, because the men land at night or have to fly at night, and a great many can not stand it after a few days. At times it takes a couple of weeks.

Senator REED. What takes a couple of weeks?

Mr. WOODHOUSE. It takes a couple of weeks to get on their nerves. It may be stated right here that the psychological side of flying is the one side which has not been considered to any extent. For instance, an airplane will only stay in the air as long as the aviator thinks that he can stay there. It is not like an automobile which will go on on the ground. It is not like a ship. That is why a great many of the early aviators, who flew with airplanes that could

only fly for five minutes without stopping, can not go up now and stay for 15 minutes. They are obsessed with the limitations of that early airplane.

Take most of the early aviators. They can not go up and do more than they did in the early days. So it is when an aviator has had a couple of bad landings, you find that simply due to the motor stopping he is obsessed with the idea that that motor is going to stop.

Senator REED. Regardless of the reasons, and you have told us your authorities for them, you hold to this proposition that if it was proposed to have 10,000 airplanes in action over the lines, or ready for action over the lines, with an aviator for each machine to fly it; and, of course, I am including in this the additional planes necessary to keep in the repair shops, etc., to keep these 10,000 planes at the front; then you hold that there must be 4,000 new men trained every month and ready to take the places of those who will fall out for various reasons, and that would mean, if it takes three months to train a man, that there would have to be 12,000 men constantly in training?

Mr. WOODHOUSE. That is quite right, with one slight modification, and that is that to keep 10,000 machines in fighting order daily for fighting daily, since the war lasts about on an average of actual fighting at least 12 hours a day, it would take four aviators at three hours each.

Senator REED. That is not a modification of my figures, which were that you were to have 10,000 planes at the battle front ready for action. That does not mean 10,000 planes in the air all the time, of course, so our figures are the same. You are simply speaking of having 10,000 planes in the air all the time, and I am referring to planes ready to take the air. Do you claim that the Army has not kept up to that program?

Mr. WOODHOUSE. I could not say that the Army has not. I should only say that between the period of April 6, 1917, and April 6—or whatever the date was of the report of the Senate Committee on Military Affairs, on what had been done and what had been ordered—the figures showed that we either had a very small program, or else had not taken into consideration the necessary replacements.

Senator REED. I am speaking about the number of aviators in training, not of the planes, now.

Mr. WOODHOUSE. Yes, sir.

Senator REED. Of course you do not claim to be a military expert, and can not tell how many planes we need on the battle front, but you do claim to be an expert along the line of replacements, etc., and that you have testified to. If military officers should determine that we need 20,000 planes, the figures which you have given would be increased in proportion—the figures as to replacements of aviators?

Mr. WOODHOUSE. Yes.

Senator REED. What have you to say about the airplanes themselves? That brings us, I think, to the second point that you make, which is, there is a great destruction of airplanes. What about that?

Mr. WOODHOUSE. The destruction of airplanes has increased greatly in the last six or nine months, on account of the more efficient barrage fire and the greater application of airplanes to a number of purposes

unknown heretofore. For instance, in the past eight months, a new application of airplanes was put into effect, which was airplanes operating with infantry. In 1916 the British brought the airplane into use for contact patrol, meaning during operations the airplanes fly under the barrage fire. Of course, it is very exact work, because they have to fly between two periods of artillery firing and also while the artillery is firing at certain heights they are supposed to operate down below to watch the effect and report. A man seldom stays up for more than an hour or an hour and a half, and then goes back and another aviator takes his place. That has nothing to do with directing artillery fire, which is an old application. The British began in 1915, and the French in 1914, to use airplanes for directing artillery fire. Due to the barrage fire, and to the very, very efficient anti-aircraft gun work and due also to the employment of airplanes to attack troops on the ground, in other words, coming within the range of the fire of a rifle, the proportion of destruction of airplanes, like that of aviators, has increased tremendously, so much so that, according to the figures of these same officers that I quoted a little while ago, 100 per cent is not excessive replacement per month. It is not at all excessive, and that deals only with what we call the tactical side of the air service. By that we mean any branch of the air service which is fixed and operates with the fighting army and not the bombing side, which is strategical and operates independently of the Army. The proportion of destruction per month which must be replaced is 100 per cent.

Senator REED. Do you mean to say that if we required 10,000 planes to be in active service on the front at any given time that at the end of the month you would have to have 10,000 new planes?

Mr. WOODHOUSE. Absolutely.

Senator REED. That is, not necessarily each of the 10,000 planes would have been destroyed, but on the average there would be a total loss of 100 per cent.

Mr. WOODHOUSE. Quite right.

Senator REED. What do you base that on?

Mr. WOODHOUSE. Absolute figures from the front, beginning with very exact figures based on the number of machines used by the Lafayette Esquadriile in 1916 and 1917. I may state that at that time in 1916, or 1917, we were training, as I stated before, aviators for the reserve at our expense, and we were willing to train a special squadron and have it a combat squadron thoroughly equipped.

Mr. Robert J. Collier, of Collier's Weekly, who was president of the Aero Club of America in 1911, and Mr. Harry Payne Whitney, and several other gentlemen wanted to have such a squadron and were willing to pay the bills, and we planned to organize a squadron the same as the Lafayette Esquadriile and have this squadron trained here by Lafayette Esquadriile men who would come here for periods of two or three months at a time while taking a rest and train this aero squadron, so we had to get the figures of exactly what it would cost to organize such a squadron and we found at that time that the esquadriile was replacing an average of about 60 per cent of its equipment.

They were replacing an average of 60 per cent of their machines. Now, since then, of course, we have had a great many new duties added to the air service, including more extensive warfare at higher

altitudes. The speed has increased about 40 per cent. The armament of aeroplanes has increased by about 400 per cent, meaning we have four guns where we had one before on an aeroplane, just purely for fighting. I may state that there are two levels at which aviators fight. If an esquadrille is assigned to a level of 6,000 feet, it stays there. It may be there to protect an artillery squadron down below, which is directly the artillery fire, and if an aviator goes away to fight a German and one of those artillery machines is shot down by a German who may be up in the clouds, he gets court-martialed. Likewise, the man operating at 16,000 feet is assigned to that sector, and is supposed to watch out that no German passes by and to protect the artillery and photography airplanes of that sector, and he is not to go off his beat, as he has to protect that particular sector at 16,000 feet.

Those are things which are seldom talked about. It would not be quite advisable at times to talk about these things in the press. It is the difference between the popular idea of warfare and what actually happens. An aviator does not run after a German unless the German happens to be in his particular sector.

Senator REED. Did you not read in the morning paper that young Roosevelt pursued a German aviator for 50 miles into German territory?

Mr. WOODHOUSE. Quite right. He no doubt is assigned to a squadron which is a "free" squadron. He is assigned to a particular sector to protect that particular sector. There are two sections, the tactical and strategical sections. The tactical sections are fixed to certain duties just as a policeman is assigned to a certain post and stays there. The others are strategical sections and are assigned to different duties according to the need of the day.

Senator FRELINGHUYSEN. Does Germany pursue this same strategy of barrage protecting artillery and going beneath the barrage?

Mr. WOODHOUSE. About the same.

Senator FRELINGHUYSEN. Is her wastage the same as that of the allies?

Mr. WOODHOUSE. It may be less, because the German aviators are afraid of the allied aviators, as a rule. There are a few squadrons that fight. The allied aviators go out and look for Germans.

Senator FRELINGHUYSEN. Where do you procure this information from?

Mr. WOODHOUSE. I happen to be the editor of two magazines—Flying, a monthly, and Aerial Age, a weekly.

Senator FRELINGHUYSEN. Have you visited the other side?

Mr. WOODHOUSE. Not during the period of the war, but I have given an average of 16 hours a day to aeronautics for 10 years. Being familiar with things, of course I construct everything I read so that it fits into everything I know.

Senator FRELINGHUYSEN. Are you an aviator yourself?

Mr. WOODHOUSE. I have flown 123 times so far. I have flown in aeroplanes of all kinds, including the Caproni and fast Italian scouts and a Liberty-motored plane.

Senator FRELINGHUYSEN. As a passenger or as an operator?

Mr. WOODHOUSE. As a passenger always. I began to fly in 1910.

Senator FRELINGHUYSEN. I presume you secure your information from interviews with aviators who come here?

Mr. WOODHOUSE. Usually. I see a number of aviators each day.

Senator FRELINGHUYSEN. Have you interviewed aviators recently?

Mr. WOODHOUSE. Yes; as late as yesterday.

Senator FRELINGHUYSEN. What is the situation in regard to the protection of our own particular sectors over there?

Mr. WOODHOUSE. I believe it will be better for me not to answer such a question, as I was not there.

Senator FRELINGHUYSEN. What is your information?

Mr. WOODHOUSE. Well, perhaps the best information is conveyed daily by Gen. Pershing's cables. Here is one now, dated July 11, to the Washington Post: "Activity of the German air service, together with abnormal troop and train movements behind the enemy's lines are the outstanding features of the situation at the American front as reported by Gen. Pershing in the continuation of his report for July 9." If the allies had a thousand more large bombing machines there would not be any movement of troops. The bridges on the Rhine that carry those troops and supplies would be wrecked, and would be kept down.

Senator FRELINGHUYSEN. The part of these reports that I do not understand is the conflict in the statements of the newspapers and the information that comes to us by hearsay; that our front is not protected by American machines and aviators; that we rely on the French and English and American aviators who are flying with the French and English. Is that true from the information which you have received?

Mr. WOODHOUSE. I may state that I have a positive point from which we can discuss that question; that is, when Secretary Baker went to France, at that time a statement was issued about the number of airplanes there. The first report of that kind that reached us came from the Paris Herald, and it said, "Secretary Baker yesterday saw 1,000 American monoplanes and biplanes." Well, now, a few weeks passed by, and then the photographs of those American monoplanes and biplanes arrived here, and they were issued by Mr. Creel's committee. The photographs given out by Mr. Creel's committee showed some French training Nieuport biplanes and some monoplanes, that are commonly called Penguins because they do not fly and do not leave the ground except for a few feet, and of course we were all disappointed with the evidence.

Senator REED. You say that the photographs by Mr. Creel showed this type of plane, but the ordinary layman—that is, the man who knew nothing about airplanes, could not tell the difference between those and fighting planes.

Mr. WOODHOUSE. He would not know the difference. Of course, you appreciate that perhaps a very enthusiastic newspaper man receiving the report that the Secretary had seen them, and the Secretary was there in the photograph with a great many others, including Gen. Pershing, that probably this newspaper man, hearing that he had seen 1,000 airplanes, might presume he meant battle planes. I am taking this for granted, and have nothing to base it on.

Senator REED. You say there were photographs of these Penguins and these training planes which were sent out by Mr. Creel. How do you know they were sent out by Mr. Creel?

Mr. WOODHOUSE. We received them for Aerial Age, a weekly, and Flying, a monthly, and paid for them.

Senator FRELINGHUYSEN. Did you publish them?

Mr. WOODHOUSE. Yes; some of them.

The CHAIRMAN. You received them from the Bureau of Public Information?

Mr. WOODHOUSE. Yes, sir; and paid for them.

Senator REED. How did you come to receive them? Was there some correspondence about it?

Mr. WOODHOUSE. Every time there are photographs of aeronautical interest they are sent to us, following the request that we made several months ago, and we pay 7 cents a print for all sent to us, and then pay \$2 afterwards for all that we publish or print.

Senator REED. What do you mean, 7 cents for an entire picture?

Mr. WOODHOUSE. Yes.

Senator REED. What is the idea in charging a pittance like that?

Mr. WOODHOUSE. The idea is that it costs probably to make a large number a few cents, maybe 7 cents, and the committee does not want to give us the prints free, so they charge us for them, and then if we print them we have to pay \$2 for the picture.

Senator REED. What I want to know is whether you have any correspondence or any circulars or anything which accompanied these particular pictures of the airplanes that we are now discussing?

Mr. WOODHOUSE. I should say that the records at my office—it is a fairly large organization, and there are 29 members on the staff—show exactly what the captions were as sent out by Mr. Creel's office. They did not state whether they were French machines, I am sure, because this point came up in a discussion in the editorial board meeting.

Senator REED. I want to get the absolute truth of what representations were made at the time these pictures were sent to you, or what representations were made in reference to the pictures before or after they were sent to you. Now, you probably have such information in your office, and what I want you to do is to send to this committee the complete data, everything you have in writing on it.

Mr. WOODHOUSE. We will be very glad to do that.

Senator FRELINGHUYSEN. Did you publish these pictures furnished by the Bureau of Public Information?

Mr. WOODHOUSE. We did in Aerial Age Weekly.

Senator FRELINGHUYSEN. Were the captions on any of these pictures of monoplanes and penguins worded so as to designate these planes as battle planes?

Mr. WOODHOUSE. I could not state without looking up the files.

Senator FRELINGHUYSEN. Do you recollect whether you changed the captions or not?

Mr. WOODHOUSE. I am perfectly certain we did, because we recognized the types of machines and we could not afford to have our readers think we did not know the difference between one machine and another.

Senator FRELINGHUYSEN. Will you get the issues of your paper and let us have the copies of the issues of your paper in which you reproduced these photographs?

Mr. WOODHOUSE. Yes, sir.

Senator FRELINGHUYSEN. Do you recall whether Mr. Baker's name was used in connection with this information?

Mr. WOODHOUSE. I have a slight recollection of seeing Secretary Baker's name, because he was in the picture.

Senator REED. We are going to expect you to produce all the written evidence you have. I want to ask you if you know of these same pictures being reproduced in other journals or papers?

Mr. WOODHOUSE. I have not a clear recollection about that, but I know that what was sent to us was the regular form and the captions were exactly as printed in the Official Bulletin of the Committee on Public Information.

Senator REED. That is, the caption to your letter?

Mr. WOODHOUSE. Yes. The photographs come with captions and are numbered, giving the serial number, and it states photograph so and so, and the serial number is so and so, and they are not written on the back of the picture, but are in a multigraphed form separately. Of course, when they come we take editorial liberties with them and change the caption to what the picture shows instead of what the caption states.

Senator REED. That is to say, that if they showed a machine that is labeled Caproni and it is only a Curtiss machine you would put Curtiss on it and not Caproni?

Mr. WOODHOUSE. We would.

Senator NEW. Those were the pictures furnished by the Creel bureau to all the journals?

Mr. WOODHOUSE. Yes, sir.

Senator FRELINGHUYSEN. Were there any other instances of that character in addition to the ones which you have mentioned with regard to Secretary Baker's visit?

Mr. WOODHOUSE. There were a great many general pictures of Secretary Baker going from camp to camp, and things like that which we did not use because they were not primarily aeronautic.

Senator FRELINGHUYSEN. Will you follow up, according to your own knowledge, any observations you have to make regarding our equipment at the front or the lack of it from information which you have received from aviators whom you have interviewed? State the dates, if possible.

Mr. WOODHOUSE. The most direct information on the subject is at a time about February or March a cable from France arrived stating that there were hundreds of aviators idle, not being trained, for lack of equipment, etc. At that time, a few days later, the Aero Club of America received a long cable, which cable was passed by the censor, and it came from the aviation field in France where the Americans were training, and where a number of aviators were permitted to cable to the Aero Club of America, complaining that there had been considerable delay with the training. They had been there for months and they could not go on with the training because there were no machines, there was no equipment. We have the cable and will be very glad to send you a copy of it. I am now speaking for the Aero Club of America.

Senator FRELINGHUYSEN. With the approval of the committee. I presume we may ask for a copy.

Senator NEW. I was just about to ask for a copy of that to be furnished to the committee.

Mr. WOODHOUSE. Then at that time a few days went by and then Gen. Wood testified in Washington before the Senate Committee on

Military Affairs, and it was made public that there was not any equipment there and that our sector in France was suffering because we had no airplanes. Of course, anything made public of that nature is very apt to be the subject of discussion at a place like the Aero Club of America, or anywhere in Washington, and almost anywhere where there are aeronautic people or military people, so a great many things were said. As an editor, I always have to base statements on facts. So I would not like to say what was stated at that time. We always have to abide by the facts as published officially. I would be very glad to present to you, if you will kindly have your secretary make a request to the Aero Club of America officially, all correspondence or cables or statements which the Aero Club of America received regarding the equipment of the American sectors in the period since the beginning of the war up to to-day.

The CHAIRMAN. Has your club also information as to the obtaining and delivery of planes on the front by English and French manufacturers? In other words, information as to the number of machines that our Government has obtained from foreign manufacturers?

Mr. WOODHOUSE. I am certain we have not any information that is positive on the subject. I think that such figures are purely talk that some officer said at some time that we did not make a note of. I have here a statement which I have prepared for this subcommittee, which I intended to send before coming myself to testify, to give the committee some information regarding my connections with the aeronautic movement and my opinions and conclusions regarding the future.

Senator FRELINGHUYSEN. I move, Mr. Chairman, that that report be put in the record.

The CHAIRMAN. There being no objection, it is so ordered.

(The statement referred to is here printed in full, as follows:)

Statement by Mr. Henry Woodhouse, member of the board of governors, Aero Club of America, etc.:

With the permission of the committee, I will first of all make the following statements regarding my connections with the aeronautic movement and the principles upon which I base my opinions and conclusions.

I am 34 years old and thoroughly appreciate that my generation has to fight this war to a finish and then to reconstruct the world and to pay the bills for both the war and the reconstruction. Therefore it is my duty to consider everything from the standpoint of fighting the war to a finish and achieving a complete victory so that we may not have to fight another war in a few years.

Having been born in Italy and having lived for a number of years in France and England and having studied the economic and sociologic problems of Europe as well as of America and having given thorough study to the factors that have been most powerful in the evolution of civilization, I have grown to consider things from the standpoint of their present as well as their future effects.

My interest in aeronautics began when I was a boy, and I have since followed very closely every development in aeronautics in practically every part of the world, giving an average of 16 hours daily to following the progress of aeronautics.

I am, therefore, familiar with all the things in aeronautics which were pronounced "impossible" during the past 25 years—things which, however, turned out to be very possible. I recall clearly how Prof. Simon Newcomb in 1902 "proved beyond question" that it would be impossible for a heavier-than-air machine to rise from the ground. And yet Prof. Newcomb had been a fellow worker with Prof. Langley at the Naval Observatory for a number of years and

had had opportunities to see the work that Prof. Langley was doing in developing an aeroplane.

After the Wright brothers made their first flight on December 17, 1903, and for five years, people all over the world disbelieved that an aeroplane could actually fly. Some admitted that it could rise, like a skipping stone, but would be unable to turn in the air. The reports of the Wrights' circular flights before 1908 were not believed, and the circle of Henri Farman in France in 1907 was held as being a stunt. Then in 1908 Wilbur Wright proved beyond doubt in his flights in France that circling was part of flying. He took the word "impossible" out of the dictionary.

Only six years ago when the Aero Club of America offered to order several aeroplanes to compete for the international aviation trophy and required that the aeroplanes make a speed of 100 miles an hour, it was criticized very generally by people who held that aeroplanes could only be used for scouting, and that for that purpose a speed of from 50 to 60 miles per hour was best. They held that beyond that speed the observer could not get a good view of what was going on below him. When the Aero Club of America authorities answered that the speed would be one of the principle factors in military aeroplanes, because aeroplanes would be employed in fighting and for bomb-dropping, so-called authorities asked, "What will you fight with—your fists?" The Aero Club authorities stated that machine guns and bombs would be used, and the technical obstructionists presented mathematical computations to show that the recoil of a gun and the dropping of a bomb weighing more than 50 pounds would upset the aeroplane. We know now that it does not, but that is what they said and many people believed them.

Those who expressed the possibility of equipping aeroplanes with two or more motors were considered visionary, and again mathematical computations were presented to show (1) that a machine equipped with two motors would be unable to lift its own weight; (2) if one motor stopped the other would make the machine spin around and, presumably, disaster would follow.

I was a member of the committee of the Aero Club of America, which in 1914-15 studied the international conditions and came to the conclusion that it would hardly be possible for the United States to avoid entering the war against Germany. I also came to the conclusion that one of the first steps to be taken to build our national defense would be to train and equip 5,000 aviators without delay.

As at that time the United States Army and Navy had less than a dozen aviators each that number seemed extreme, even as a program to be carried out within three years.

The general opinion was that only exceptional men could learn to pilot an aeroplane, and as the Army was short of officers and could not get the 30 officers for the aviation section which had been authorized by Congress, our committee urged the Aero Club of America to undertake to solve the problem by training civilian aviators and forming a reserve of trained men who would be available in case of need. This work was done, and as a result there were trained at private expense 300 aviators, who were eventually taken over in the Army and Navy Reserve Flying Corps, and were the first 300 aviators to be sent to France. Col. Raynal C. Bolling, who recently lost his life at the front, and Capt. James A. Miller, who also lost his life recently at the front, were the first two men to be trained with the funds contributed by ourselves and by our friends. The first two American aviators to lose their lives while hunting U-boats off the French and British coasts were also aviators who were trained at private expense, being members of the first unit of the aerial coast patrol organized by us in 1916.

Besides the 300 aviators who were actually trained at private expense there were about 2,000 men who joined the air service as a result of our efforts.

We all like to think that the war will end like a summer shower ends, and sunshine and blue sky will follow; yet we know that the possibilities are that it will be like a forest fire which smoulders for a long time and sets new areas of woodlands afire with every changing wind.

So while keeping our hearts in the right place, ready to accept and appreciate the first, we must prepare to safeguard our generation against the disaster that would follow if we were not ready to deal with the second.

As a member of the committee of the Aero Club of America which has been developing the plans for the trans-Atlantic flights, and has followed the plans of other countries to establish extensive aircraft lines to transport mail, express, and passengers over long distances, I share the opinion of others who

have studied this subject that the plan to deliver aeroplanes by flying them across the Atlantic, if carried out a thousand times in six months and ten thousand times in a year, will help greatly in winning the war soon, and will at the same time be a substantial step toward meeting a condition which may arise and which safety for our generation demands that we protect against, as Mr. Alan R. Hawley, of the Aero Club of America, pointed out recently, an important consideration that led to the creation of the air ministry in Great Britain was the knowledge that Germany is planning extensive aerial mail, express, and passenger transportation lines to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of aircraft. This would give her a reserve air fleet large enough to blow England, France, or Italy off the map overnight. As was brought out in the House of Commons by Lord Montague aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. A nation that overlooks this fact may pay dearly for its oversight.

We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids of Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So, while keeping our hearts in the right place, we must be ready to protect the Republic and the rights of humanity and the cause of civilization.

We must, of course, think with both our hearts and our minds when contemplating the reconstruction that will follow the war. We will need both.

And in considering the factors that should be brought to assist in this reconstruction, let us consider what is best for the largest number of people for the longest time.

Let us not forget that our generation has seen in a short space of time a marvelous sociologic and economic revolution, which has been due essentially to the advent of fast transportation and intercommunication. These two factors which are the veins and arteries of civilized life, by mixing people and their interests and bringing nations into closer relations, were evolving such a unity of thought and homogeneity and common interest before the war that we were able to conceive of evolving a world nation.

Thanks to the railroad, the automobile, the telegraph, and telephone, we saw the causes which had brought about the Civil War eliminated, despite the fact that the people who lived at the time of that war maintained that these causes would always exist and despaired of their elimination; and the solving in the short period of 50 years harassing problems that once seemed insoluble. The people of each side, who thought they could never forget, and their interests, were so thoroughly mixed that the North and South became mere astronomical terms.

Aeronautics promises to be a potential factor in the reconstruction that will follow the war because aerial transportation not only makes transportation many times faster than the transportation of to-day, but also brings the stupendous elimination of frontiers, of physical barriers, which have ever stood between people, preventing their amalgamation.

The humanizing qualities of aircraft are truly wonderful. Whereas the automobile, the railroad, and other terrestrial means of transportation, and the ship, must halt before obstacles, and progress is limited to overland in the first instance and over water in the second, the progress of the aircraft is unhindered and unlimited. Human flight has opened the sky to man, giving a new road in which to travel, and because it is a road free from all obstructions and leads everywhere, affording the shortest possible distance to every other place, it offers to man in its prospective developed stage, unlimited freedom.

Spanning continents like railroads, bridging seas like ships, going over mountains, forests, and all physical obstructions like nothing except the bird—all at the same time—the aircraft brings the elimination of frontiers and the physical connection of nations.

So the outlook is bright, provided we keep our hearts in the right place but do not fail to prepare to meet any emergency that may arise and that, in the words of Secretary Baker, we do not forget that it is not enough to prepare to fight—we must prepare to win!

The CHAIRMAN. Mr. Woodhouse, were you requested by any person or person acting in any official or semiofficial capacity to give your views in writing regarding the condition of our aviation program and to make suggestions as to what it should be and how it should be carried out, and, if so, when and by whom?

Mr. WOODHOUSE. Yes, sir. Early in December and January, 1918. I was asked by Mr. Eugene Meyer, jr., of the War Industries Board, to come to Washington. I saw Mr. Meyer in the War Industries Board building, and he stated that he had been requested by Secretary Baker, I believe, to look into the aircraft situation, and after discussing the aircraft situation he asked if I could write a pen sketch of the most important aspects of the aircraft situation, covering what should be done and why it should be done and how it could be done, and what problems might arise to prevent the carrying out of the program and how the problems could be solved. I made such a report in full, a copy of which I will hand you forthwith. I presented the report in January, and the only changes in the figures given in the report are regarding the number of airplanes required to keep an aviator on the fighting front for one year.

At the time I made the report the only figures available were for the year 1916-17. Therefore the figures on the number of airplanes required to keep an aviator fighting for one year are smaller than what are required to-day. Otherwise the situation regarding what must be done and how it can be done and the problems to be solved to carry out a successful aircraft program are the same.

(The report referred to is here printed in full, as follows:)

THE MOST IMPORTANT ASPECTS OF THE PRESENT ALLIED AERONAUTIC SITUATION.
 BY HENRY WOODHOUSE, MEMBER BOARD OF GOVERNORS, AERO CLUB OF AMERICA.
 VICE PRESIDENT AERIAL LEAGUE OF AMERICA.

The most important aspects of the present military aeronautic situation are:

(1) *What the allies expect to get from the United States in aircraft, materials, and aviators by summer, 1918.*—Articles have appeared in the press of Great Britain, France, and Italy, and expressions in the editorials in the allied press show that the general public in the allied countries believes that the United States during the spring and summer of 1918 will send to the allies thousands of trained aviators and airplanes and motors, the numbers to be substantial enough to materially assist the allies in maintaining supremacy in the air at the fronts and to bomb German bases.

To a great extent this is the expectation to be found in aeronautic circles in Great Britain, France, and Italy, and there is found a general tendency to rely on and look forward to the time in the coming summer when the United States will send over tens of thousands of Liberty motors and large amounts of aeroplane parts and materials. These expectations have been confirmed to a great extent by (a) the appropriation of \$640,000,000 for aeronautics for the Army and close to \$100,000,000 for the Navy; (b) by the statement issued by Secretary Baker last October confirming that already published items in the estimates which stated that the program called for over 22,000 airplanes and 40,000 motors; (c) by the statements made last August in connection with the announcement of the Liberty motor; (d) by similar announcements and numberless articles based on the fact that Congress had given over \$700,000,000 for aeronautics and the fact that the United States is known the world over to have huge sources of supplies, manufacturing facilities, etc.

(2) *What the United States promised to do aeronautically at the time when Italy was victorious and Russia was fighting.*—At the time when Italy was victorious and Russia was still fighting the press and general public of the United States promised to send the allies aviators, aeroplanes, and motors in practically an unlimited number, beginning by sending aviators in a few months after our entry in the war, to be followed by materials needed for the

construction of aeroplanes and motors in the allied countries, to be followed on about July, 1918, by thousands of aeroplanes and motors, complete and in parts, and small dirigibles and kite balloons and other equipment.

It is not likely that many of the allied authorities who dealt with our officials regarding this matter agree as to what was actually promised. Different authorities gathered different impressions from what was said at the time. Some interpreted the statements made to mean that we would send 20,000 aeroplanes, with the necessary spare motors, instruments, and equipment, beginning with next July. Others gathered that we were going to send thousands of Liberty motors, beginning with this spring (1918).

(3) *Action of the United States in sending hundreds of untrained aviation students to France causes criticism that the United States is taxing the allied manufacturing facilities, available gasoline and supplies, and taking hundreds of aeroplanes from the fronts.*—Soon after our entry in the war the allied representatives stated that one of the greatest needs was for men and requested that we send men to France, including military aviators and partly trained aviation students, whose training could be completed in France. The United States complied with this request in the late summer and fall, 1917, and have probably sent over 1,500 military aviation students to France since. But only less than 100 of these had taken their junior military aviation test, which means that they had only about one-half of the training necessary to make them military aviators. Of the rest a great number were students in the "cadet" class who had only had from six to eight weeks of theoretical training at the universities where "ground" training is given. The rest had had only a few hours of preliminary flying training at different Army aviation training camps extending over a few weeks or months. It is understood that France thought we had more fully trained aviators to send over, else she would have asked that we train our students in the United States and save the considerable tonnage wasted in transporting food, supplies, and equipment to our students there.

As a general rule, it takes about 100 hours of flying on different types of aeroplanes to make a finished military aviator, and it takes, roughly, an average of two aeroplanes to train each military aviator, due to the extensive breakage caused by general haste in training them. The aeroplanes used during the period of training, including the preliminary training machines and the twin-motored Caudron biplanes used for advance training, and the high-powered fighting machine used for the last stage of the advanced training, consume an average of not less than 10 gallons of gasoline and 1½ gallons of castor or other lubricating oil per hour.

France has, therefore, had to face the proposition of supplying at least 2,000 aeroplanes for the training of our aviators, with as many motors, and an average of 1,000 gallons of gasoline and 150 gallons of oil for each American aviation student that we have sent over. It is pointed out that since the tonnage is limited, it means having that many aeroplanes less at the fronts; or that much less food, supplies, and clothing that could have been saved had these students been trained in the United States.

Had Italy remained victorious and Russia continued to fight, this drain on the allied resources would probably have been met without complaint. But under the changed conditions this drain is felt, and the training of American aviation students have been delayed, and, at the same time, the allied authorities have requested that the United States do not send any more untrained students over.

Up to January 1, 1918, less than 10 of the junior military aviators that were sent over had graduated to finished military aviators. Official dispatches stated that Lieuts. Edwin M. Post, Jr., and Hobey Baker were the first two to graduate, and have been assigned to instructing others.

A great many complaints have been received by parents of aviators who are training at Tours and other places in France, stating that the training has been very slow, the delay being caused by the shortage of aeroplanes, gasoline, and supplies. There are over 250 students at Tours alone, some of whom had been there since last April, having entered the Franco-American flying corps soon after America's entry in the war.

The situation has been aggravated in France by the recent order, attributed to the office of the Signal Corps in Washington, limiting to second lieutenant the commission of several hundred American aviation students in France, who have been there for months, but whose training has been delayed through the existing conditions. This is stated to be part of a general order from the

Signal Corps that went into effect on December 15, 1917. The unfortunate part is that hundreds of other students who only get their preliminary course in the United States, which is only a fraction of the training that the students in France have had, have been given first lieutenant's commission. Therefore it seems to be an injustice, and the students in France are complaining bitterly. The civil and military authorities in France seem to be in sympathy with the students. This adds to the unpleasantness of the situation there, and the sooner the order is modified to permit the students in France to look forward to first lieutenancy, the sooner this source of trouble will go out of existence.

(4) *What the United States must send to the allies to prevent the public and press of the allied countries from launching into bitter criticisms of the United States in the event of allied reverses in the coming spring and summer.*—Regardless of what we promised at the time when Italy was victorious and Russia was still fighting, one thing is certain, and that is that unless we do send the allies a substantial quantity of aeroplane and motor parts and aeronautic equipment and materials, the allied public and press are apt to launch into a campaign of bitter criticisms against the administration as soon as the allies meet with reverses, or some allied authority get discouraged and states that the United States has not given material assistance aeronautically.

Therefore every effort should be made to rush the manufacture of the parts of aeroplanes wanted by the allies, the manufacturing of which is already under way in the United States.

This phase of the situation is similar to the situation that has existed in England for the past three years. Whenever the Germans drop bombs on London a few days in succession the public and press launch into bitter criticism of the "inefficiency" of the antiaircraft defenses. Then the matter came up in Parliament, and the secretary of state for war or the secretary of the air board tried to explain how it happened, defend the authorities in charge of the air service, or promised to take steps to get a larger number of aeroplanes for the protection of London. But as the raids continued the public and the press demanded action, and that, more than anything else, caused changes of high officials in the British Government and upset the Government itself a number of times.

(5) *Our present military aeronautic plans as expressed by the estimates for appropriations submitted to Congress last year and this year.*—At the time the bill providing for the appropriation of \$640,000,000 for military aeronautics was discussed and introduced—in June-July, 1917—it was stated that the bill would provide for 22,625 aeroplanes, to cost \$380,340,000. It was also stated that the bill would provide for approximately 49,000 motors, which would figure, roughly, at two motors per machine.

The above figures have been included in practically every official or semi-official statement or article published since.

The estimates submitted recently ask \$1,032,294,260 for aeronautic equipment and contain provisions for pay for 11,941 officers and 153,945 enlisted men; also \$235,866,000 for aeroplanes and seaplanes; \$47,173,200 for spare parts and accessories; and \$563,289,120 for extra engines and spare parts.

In these days of fluctuating prices, unsettled labor conditions, and other uncertainties it is not easy to figure out exactly what the appropriation for aeroplanes and motors would provide. The actual number also depends on the size of the machines.

The clearest item is the provision for the pay of close to 12,000 officers and 144,000 enlisted personnel for the Aviation Service. This means, roughly, that provision must be made for training 10,000 military aviators for the Army. To every aviator there must be trained, roughly, two aeroplane mechanics and two motor mechanics to take care of repairs, etc., in the hangars or repair shops. This makes a total of 10,000 aviators and 80,000 mechanics to be trained.

At the hearings held before the Senate Committee on Military Affairs on January 10, Secretary Baker stated that on January 1, 1918, the Aviation Section of the Signal Corps consisted of 3,900 officers and 82,120 men. The writer recalls reading or hearing in one of the addresses delivered by a Washington official that about 1,500 military aviation students have been sent to France and a few hundred sent to Italy. Assuming that altogether there have been sent 2,000 aviation students to the allies, there remain 1,900 under training in the "ground schools" (at the universities) and at the aviation training camps in different parts of the country.

A few hundred of the officers included in this report are "nonflying officers," in charge of various duties connected with administration, production, and inspection, etc. This leaves approximately 6,000 officers who still have to go through the "ground course," preliminary, and advanced training. Most of the aviation students under training are either in the "ground-course" stage or in the "preliminary-training" stage.

The itemized estimates showing how the \$1,032,294,260 for military aeronautics is to be spent are given in the Appendix, marked "A."

(6) *What Germany is probably doing to prepare to meet our aerial program.*—From time to time, ever since the entry of the United States in the war, and practically in answer to every statement made that the United States greatest contribution to the war would be aviators and aeronautic equipment, there has come an answer from one of the German authorities stating that Germany does not fear what the United States may do, and that Germany will be ready to meet our largest aeronautic plans, with an overwhelming margin in her favor.

Perhaps the best basis upon which to figure what Germany may do to meet our aerial program may be to revise her actions in the past two years to meet the British and French aerial programs, which is done herewith in brief:

Germany's efforts to meet the allies' aerial programs in the past three years may be classed as follows:

(a) To maintain or try to achieve aerial supremacy on the different fronts, Germany somehow always provided a large enough number of aeroplanes of different types to prevent the enemy from having more than temporary supremacy on any point. At times she made strategic moves by the adoption of types of aeroplanes especially adapted for existing conditions, thereby achieving temporary supremacy. This was true when Germany adopted the Fokker machine, which, through having excessive horsepower in proportion to its size, was a product that scientists would have condemned as dangerous and inefficient; but it supplied a type of aeroplane so much faster than the allies' aeroplanes that the Germans for a period of time predominated through its use.

(b) To weaken the allies' aerial strength at the different fronts by forcing them to send aeroplanes, antiaircraft guns, and munitions in large quantities to protect their cities, the Germans bombed British and French cities, especially London and Paris, thereby causing hysterical public demands for protection—which forced the British and French authorities to take and keep hundreds of aviators and thousands of aeroplanes and armament from the different fronts.

The Germans have had the advantage of having bases on Belgian soil, which makes it possible to bomb British and French centers and create panics in British and French populated centers with almost any type of machine available. The allies, on the other hand, have had two disadvantages, as follows:

(a) The aeroplanes at hand were mostly small, with a limited radius of action, not capable of raids across the Rhine to strike at German military centers and aerodomes and bases located in the outskirts of Berlin, Potsdam, and other German cities, thereby creating panics in German populated centers. Practically all the raids made by the allies in the past two years were directed against German bases on Belgian soil. While this did damage, it did not strike home to the German people.

(b) The policy of the allies has been utterly against what were termed "reprisals." Until the last change in the British administration and the creation of the air ministry, there was a bitter opposition in British officialdom to bombing German centers. The fact has been overlooked that there are several scores of military aeronautic bases in the heart of Germany, near Berlin and other German cities, which could be bombed, thereby bringing the war close to the German people. If the allies were to bomb for a period extending over a few weeks German aerodomes and bases near populated centers, and destroy the bridges on the Rhine, over which all supplies from Germany to the different fronts must pass, the German public and press would soon cry for protection, and that would force the withdrawal of hundreds of aviators and thousands of aeroplanes, antiaircraft guns, and munitions from the fronts to protect the different cities. By conducting continuous systematic attacks against different cities at different parts of Germany every city would demand such protection, and to supply it would probably take much of the aeronautic equipment which Germany is using at the different fronts.

What Germany is probably doing to prepare to meet our aerial program may be summarized as follows:

(a) Building thousands of fast armed aeroplanes to maintain supremacy on the fronts.

(b) Building thousands of large aeroplanes to bomb French, British, Italian, and Russian cities and force the allies to use most of their aerial equipment to protect their cities.

(c) Building thousands of large bombing machines with which to destroy allied bridges, railroads, lines of communication, military and aeronautic bases.

(d) Building torpedo planes to attack ships.

(e) Building aerial torpedoes, mechanically operated, which can be launched from U boats against coastal cities and naval bases, and which Germany may use to attack American coastal cities so as to force the United States to keep its aeroplanes here to protect its cities against such attacks.

(7) *Howard E. Coffin's report regarding the status of aircraft building program adopted at the time when Italy was victorious and Russia was fighting.*—On January 10, 1918, Mr. Howard E. Coffin, chairman of the Aircraft Board, delivered an address to the Society of Automotive Engineers at the Biltmore Hotel, New York, at which the writer was present.

Mr. Coffin's address was printed in the Official Bulletin for January 11. It is to be found in the appendix, marked "B." in full, as reproduced in the February number of Flying.

Mr. Coffin made it clear that the aircraft program being carried through is the same program that was adopted at the time Italy was victorious and Russia was still fighting.

Mr. Coffin's report deals with generalities and technicalities, but it is explicit and clear on one point, and that is that while the estimates for the next year's appropriations provide for pay for about 12,000 officers and 160,000 enlisted men for the Aviation Section, Signal Corps, **the Aircraft Board has not yet taken up the matter of revising the air program to meet the situation created by the Italian reverses and the withdrawal of Russia from the war.**

Other authorities who attended the S. A. E. meeting held in the afternoon of January 10, preceding the S. A. E. dinner, made detailed statements, including the following:

That about 30,000 Liberty motors have been ordered.

That the Packard Co. was delivering five Liberty motors a day and had delivered about 40 on that date, half of which had been sent to France.

That the production of Liberty motors was being held up because of certain "final" changes being made, but the expectation was that these changes would only take a few weeks.

That an order for 2,000 "Super-Liberty" engines were ordered from the Duesenberg Motor Co.

That parts for 1,250 twin-motored Handley Page bombing machines had been ordered from different firms and that plans were being considered to supply other motors if the Liberty motor could not be produced in sufficient number by a given time.

That if the Liberty motor comes within 10 per cent of the official expectations it will be the best aeroplane motor in the world.

That the United States Army has adopted the British De Haviland No. 4 biplane and the British Bristol biplane, and orders have been placed with American manufacturers for close to 10,000 machines of these types, canceling orders for other types placed before.

TENTATIVE POLICY AND PLAN TO MEET THE SITUATION CREATED BY THE ITALIAN REVERSES AND RUSSIA'S WITHDRAWAL FROM THE FIGHT.

The policy to be adopted regarding military aeronautics to meet the situation created by the Italian reverses and Russia's withdrawal from the fight must be based on the following considerations:

(1) That the United States must provide in the shortest possible time the aircraft, aviators, materials, and equipment needed.

(a) To send to the allies to make up for the burden they have assumed by supplying aeroplanes and equipment for the training of the approximately 2,000 American aviation students that have been sent over, and approximately 250 Americans taken over from the Franco-American Corps; and to meet the bitter criticisms that will be launched against Washington by the public and press of the allied countries in the event of allied reverses in the spring and summer of 1918.

(b) To send to the allies to be used by American and allied aviators at the different fronts.

(c) To give preliminary training in the United States to the about 8,000 aviators still to be trained to carry out the plan to train 11,041 officers to the Aviation Section, Signal Corps, given in the official estimates.

(d) To give advanced training in the United States to these 8,000 aviators.

(e) To equip these 8,000 aviators when their training is completed and supply the average of six aeroplanes per aviator needed to keep him in the fight for one year.

(f) To train the about 80,000 aeroplane and motor mechanics needed to go with the aviators (about two aeroplane and two motor mechanics for every aviator on the field and the same number for the repair shops, hangars, etc.).

(g) To meet possible German success on different fronts. The executive committee of the Aero Club of America, which has studied the situation thoroughly, and has had the unreserved advice and criticism of allied authorities, adopted the following resolution on November 12, 1917, advising the creation of an "emergency air fleet" to meet possible German successes:

"Whereas the greatest difficulty of the allies has been to move their forces fast enough to meet unexpected German attacks on weak points of the allied lines, and to overcome the advantage which the Germans have of being able to transport large bodies of troops, ammunition, and supplies from one point to another by interior lines; and

"Whereas it is evident that powerful war planes afford the needed combination of power and mobility in a higher degree than do any other appliances, and that the recent occupation of the Baltic Islands by Germans and the Italian reverses in the Province of Venezia could have been prevented if the allies had been able to send a sufficient number of torpedo planes and bomb-dropping aeroplanes to assist the Russians and Italians at the first evidence of danger; and

"Whereas it is generally accepted by the recognized authorities on aeronautics that aeroplanes can easily be built which can fly across the Atlantic, and thereby solve the problem of delivering large units of aeronautic power to England, France, Italy, and Russia, without dependence on ocean transportation or interfering with it; and

"Whereas there are in the United States unutilized manufacturing facilities and resources which could build thousands of powerful war planes during the coming year without interfering with the present aeronautical program of the Army and Navy; and

"Whereas these aeroplanes can conduct major aerial operations against the German fleet and U-boat bases, as well as against the German lines of communication and military and industries and forces: Therefore be it

Resolved, That these facts be brought to the attention of the President, the Council of National Defense, the Secretary of War, the Secretary of the Navy, the Aircraft Production Board, and to the American public, through the press, and that the coming Congress be urged to expend the present aeronautical program by appropriating not less than \$1,000,000,000 for building an "Emergency Air Fleet" of huge war planes, and also appropriate \$1,000,000,000 to carry out a comprehensive aeronautic program of training aviators and building the tens of thousands of fighting, photography, artillery and contact patrol aeroplanes, dirigibles and balloons which are needed to assure the allies' supremacy in the air."

(2) (a) That it takes an average of two aeroplanes and three motors to train an aviation student from the "ground course" to the status of full military aviator, when he can take up any of the duties of military aviator at the front—including a period of training on fighting machines and large bombing machines;

(b) And that the life of an aeroplane at the front is usually less than two months. Therefore, it takes a minimum of 6 aeroplanes, 9 motors, 12 propellers, and 12 magnetos to keep each aviator at the fighting front for one year.

(3) That it is not sufficient to do our best if our best does not meet the situation, and that no excuse or justification is accepted by the public and press for failures which involve losses of thousands of men and cause catastrophes such as happened to Italy—or result in such tragic situations as resulted through the inability on the part of the allies to help and guide Russia. The British public does not accept justification and excuses when German aeroplanes drop bombs on British cities. It demands, and has forced repeatedly, changes in the Government and administration.

(4) That the United States must do in 1918 what we shall have to do in 1919 or 1920—after suffering enormous losses—if we do not grasp the fullness of our task and do not anticipate situations and forestall reverses.

(5) That it is absolutely necessary not to delude ourselves and our allies by such matters as—

(a) Listing students as "military aviators," thereby conveying the impression that we have fully trained aviators ready for war duty, whereas we have only students who have just begun their training or only gone through the first, second, and third period of training and still have from 80 to 100 hours of actual flying to go through. From such misleading use of terms our allies as well as our authorities and public gather false impressions that a given number of aviators are ready to fight, whereas, they are not only not ready, but the very aeroplanes which they are to use for advanced training are not yet manufactured;

(b) Figuring as "orders in production" tentative orders, the specifications of which have not yet been decided, etc.

(6) To the fact that sufficiency is the first element of efficiency and that making plans based on minimum—such as minimum number of aviators required; minimum number of machines required to train and equip them; minimum amount of appropriations required to carry out the program; minimum manufacturing facilities required to manufacture the equipment—leads to confusion and disaster. It is necessary to have sufficiency in every part of our plans and programs and of any factor necessary to carry out the plan and program successfully.

(7) To the fact that the stakes in this war are so huge that the possible "waste" involved in haste, or in the necessity of having substantial working margins, is of no consequence. It is well to bear in mind continually that this war is costing daily to the allies not less than \$200,000,000 in actual expenditures and about \$300,000,000 more in losses in cessation of commerce, the destruction of towns, cities, and other physical properties, and the original cost of ships and their equipment; the cost of training and equipping men, etc. This does not include the value of human life. The daily loss on the part of the allies is about 6,000 lives.

(8) That both from the standpoint of time saved as well as to encourage patriotic interest on the part of labor, it is best not to waste time in quarreling with labor over wages. As a general rule, a workman takes a greater interest in the welfare of his country if the wages are sufficient for him to maintain a fairly good home. The workman as a rule does not hoard. As he earns more, he spends his money more freely, and if he does not subscribe to the Liberty loans, he nevertheless spends his money freely and enables those with whom he trades to purchase a greater amount of Liberty bonds. Therefore, considering everything, particularly the necessity for haste in carrying out the war program, it is best to pay the necessary wages and salaries and eliminate costly delays in production from this cause.

This is said, of course, only as a matter of advisable policy, so long as it is not decided to conscript labor.

(9) That while the factories are manufacturing tens of thousands of aeroplanes and motors that must be sent to the allies as soon as possible, and the thousands of preliminary training and advanced training machines needed to train the 8,000 aviators in the United States, we must consider the problems of delivering large numbers of aeroplanes to the allies created by the shortage of tonnage. The least that can be done is to order as many trans-Atlantic flyers as can be built in the experimental departments of the different factories—without interfering with actual production of aeroplanes.

This plan is considered as thoroughly practical by the authorities who have studied the problems. Eliminating the accidents of war, carelessness, and accidents an aeroplane to-day has a life of about 600 "flying hours." In other words, it can fly for 600 hours, provided that these 600 hours do not extend over a period of more than 18 months. During that time the machine needs only general "tuning" and the possible changing of a few wires and tires.

The life of the average motor which is run throttled down and receives a normal amount of care is about 500 hours. A trans-Atlantic flier would have three or more motors, which would only be run at full power for short periods of time when the machine leaves the ground with full load. After that they would run throttled down, and there would be periods of rest for each motor in turn.

The trans-Atlantic flight would take less than 40 hours from the life of the machine, leaving a good margin for many trips to bomb German bases.

The least that can be done is to order as many "trans-Atlantic fliers" as can be built without interfering with production. And the least that can be expected as a result is the developing of good air cruisers for long distance cruising. Therefore, there is no loss of any kind involved in placing orders for such machines. On the other hand, there is the possibility of solving the problem of delivering the war planes to Europe by flying them across the Atlantic, thereby supplying the Allies with the war planes needed to strike at Germany through the air, wreck the bridges on the Rhine, the military and aeronautic bases, and the U-boat and naval bases. In the event war comes to an end while thousands are being manufactured, they can be used for transportation of mail, coast guard work, etc. The naval aspect of the matter is not given herewith because of the necessity of confining this report to the military aspect.

(10) That it is necessary to anticipate possible German successes on the different fronts and to figure out what the Allies must do aeronautically to meet these German successes.

(11) That it is also necessary to decide on an aeronautic program to be part of the coast defenses of the United States. Practically none of the coast artillery rank and file of the 73 forts in the United States have had the opportunity of acting in cooperation with artillery fire observers in aeroplanes or kite balloons. Arrangements should be made to train artillery balloon observers at the different forts so as to give the observers the familiarity that they need with artillery and give the artillerymen the familiarity they need with aircraft and their work in directing artillery fire.

(12) It must also be decided whether or not the Army having charge of the coast defense should have a dirigible balloon section to operate with the coast defense, convoy Army transports, etc.

A number of dirigibles are absolutely necessary for the defense of our possessions, and the work to be done by them—particularly in the Philippines, Hawaii, and Panama Canal—is mostly work which is under the jurisdiction of the Army.

(13) It is also of great importance to be ready to be of immediate assistance to Russia in the event that Russia starts fighting Germany again. Two hundred bombing planes piloted by allied aviators on the eastern front can attack German military bases and force Germany to take aeroplane guns and troops away from the other fronts, thereby weakening her forces on the other fronts.

(14) There should also be decided whether to immediately take steps to create interest in the war in the Latin-American countries that have declared war against Germany, by inviting each country to send 20 or more aviation students to be trained at United States Army aviation schools.

(15) In a general way the policy should be to send to our allies all the aeroplanes and motors, whole or in parts, and materials that can be shipped, and all the aeroplanes that can be flown over.

When parts are shipped the aeroplanes and motors will be assembled in the huge assembling plants being established for the American Government in France and England.

NUMBER OF AIRCRAFT AND MOTORS OF DIFFERENT TYPES NEEDED TO SEND TO THE ALLIES TO TRAIN 10,000 AVIATORS AND SUPPLY THEM WITH THE AEROPLANES NEEDED FOR ONE YEAR OF FIGHTING.

To carry out the program already outlined will take the following types and numbers of aircraft and motors:

(1) To send to the allies to make up for the burden they have assumed in training the American aviation students that have been sent to France and to forestall the bitter criticism that will be launched against the Government by the public and the press of the allied countries in the event of allied reverses in the spring or summer of 1918, there will be required and steps should be taken to produce not less than 10,000 aeroplanes of accepted types, preferably large bombing types, being used by the allies, such as the Handley Page twin-motored, the Caproni three-motored, and the Avro twin-motored bombing machines.

Provided prompt action is taken it would be possible to make quick deliveries of the parts for Handley Page and Caproni machines, because the drawings of

these machines are in this country and there are also experts from the Handley Page factory and the Caproni factory in this country ready to supervise the manufacture of parts or complete machines.

There are also in this country the blue prints and experts from the British De Havilland factory, and the British Bristol factory, and steps have already been taken to produce the De Havilland and the single-motored Bristol machines in this country.

By deciding not to make any changes in the drawings of these machines and placing orders for all the parts needed for these machines and allowing the experts from the different countries to supervise the manufacturing in cooperation with good American production men, it might be possible to ship parts in large quantities, beginning between six and eight months from date.

Orders for some of these machines have already been placed in the United States by the American Government, namely, 1,250 Handley Page, and the other types, with the exception of the Avro, in different quantities.

The plan was to equip them with Liberty motors, it being assumed that the Liberty motors will be adopted for these machines and will be available in large quantity in the near future.

If it is found impossible to supply the required number of Liberty motors for this purpose in the short time available, or if there is any doubt as to whether the Liberty motor will be adapted for these machines, decision should be reached to build the parts for these machines and ship them as soon as possible and to try to supply at the same time as many parts and materials for Rolls-Royce, Fiat, Isotta-Fraschini, and similar standard British, Italian, and French motors as possible.

Each twin-motored machine must have two spare motors, making a total of 40,000 motors that must be provided for the 10,000 machines to make the job complete.

(2) To send to France to be used by the (about) 2,000 American aviators undergoing their training, there should be sent over about 4,000 preliminary-training and advanced-training machines, to be followed by 12,000 machines of different types—or an average of 6 machines per aviator—to keep them on the fighting front for 1 year.

One spare motor must be sent for every single-motored machine and two spare motors for the double-motored machines.

It will take, roughly, 4,000 motors for the preliminary-training machines, 1,000 for fast single-motored advanced-training machines, and 2,000 for twin-motored advanced training machines. Then, assuming that in the allowance of 6 aeroplanes per aviator, to keep in the fight for one year, means half, or 3,000 single-motored machines, and the other half, or 3,000 two-motored machines, the very lowest total that should be figured on is 30,000 motors of different types to be sent to France to complete the training and keep our American aviators in the fight for 1 year.

(3) To give preliminary training in the United States to the (about) 8,000 aviators still to be trained will take an average of 1 aeroplane per student, or a total of 8,000 preliminary-training machines of the single-motored type, such as the Curtiss type. Each machine must have a spare motor, making a total of 16,000 motors needed for preliminary training.

(4) To give advanced training in the United States to these 8,000 aviators will require not less than 8,000 machines of different types, including fast combat machines, the three-passenger machine, which is better than the single and two passenger for aerial photography, directing artillery fire, and similar purposes. It is better because it has two gunners, and therefore can protect itself in case of its being attacked by one or two enemy aeroplanes. The two-seater machine is also used in France and England, but the general consensus of opinion is getting to be that the three-seater machine is the most efficient and economic. It is economic because it can go out alone and can protect itself, whereas the two-passenger machine, having only one gunner, has to be protected by fast combat machines, which found it hard to protect it.

There will also be needed large two-motored or three-motored bombing machines for the advanced training. Assuming that half of the advanced-training machines are single-motored machines, and a spare motor must be allowed for each machine; and that the other half will be twin-motored advanced-training machines, and that two spare motors must be allowed for each machine, the total number of motors needed for advanced training will be 32,000. If the percentage of breakage proves to be low, then there will be a surplus of machines and motors for this section of the plan to use for other purposes. The use of

these advanced-training machines creates a substantial air force for the defenses of the United States.

(5) To equip these 8,000 aviators when their training is completed and supply the average for one year requires 48,000 aeroplanes of different types. Just what types should be adopted for the purpose is a matter to be decided after considering the types available and under development, but, as a general rule, it is best to place reliance on the larger types of aeroplanes, which can always be used for bomb dropping at night and will never be useless, no matter what the Germans may develop in the meantime.

Assuming that, whereas, it has been found that it is safer and more economical to use twin-motored machines, one-third of these 48,000 aeroplanes will be single-motored machines, one-third will be twin-motored machines, and the other third will be three-motored bombing machines. The total number of motors will be, roughly, as follows: 16,000 motors for single-motored machines, and one spare motor to each machine; total, 32,000; 16,000 twin-motored machines and two spare motors per machine, 64,000; 16,000 large bombing machines, each equipped with three motors, and allowing three spare motors for each, 96,000 motors.

To train, equip, and keep in the flight for one year 10,000 aviators and send 20,000 aeroplanes to the allies takes about 100,000 aeroplanes, with not less than 250,000 motors.

UNITED STATES HAS THE MANUFACTURING FACILITIES AND PARTLY TRAINED PERSONNEL TO MANUFACTURE 100,000 AEROPLANES AND 250,000 MOTORS WITHIN 12 MONTHS.

There is no doubt in the minds of people who are familiar with every phase of the manufacturing and aeronautic situation in the United States that the United States has the manufacturing facilities and the partly trained personnel needed to manufacture 100,000 aeroplanes and 250,000 motors a year, and a corresponding amount of other aeronautic equipment.

The main source of trouble to the aeronautic authorities during the past year has, in fact, been that scores of large concerns engaged in woodworking, metal working, furniture, pianos, automobiles, and other similar lines of manufacturing have been making efforts to get orders for aeroplanes and motors. To get these orders they called on the different authorities again and again and sought in every way to make known the fact that they had factories and half-trained personnel which they could engage immediately in the important work of producing the much-needed aeroplanes and motors.

This excess of manufacturing facilities actually resulted in delays in placing orders and considerable trouble. In other cases substantial people were told at first that their facilities would be needed and they actually made plans for the production of aeroplanes and motors; but were subsequently told that there was no business for them.

MAIN CAUSES OF DELAY IN THE LAST 12 MONTHS.

The main causes of delay in production in the past 12 months, which must be avoided in the future, have been:

(1) *Delays in deciding on types of aeroplanes and motors to be manufactured.*—This has been the greatest difficulty, and is the reason why, for instance, the Handley-Page twin-motored bombing machine was not adopted in May and June, 1917, when Handley-Page representatives offered to start a factory in the United States, with American capital. Had this machine been adopted, the factory would now be turning out each day a number of such machines to send to the allies and for advanced training. The same is true of the Caproni machines.

(2) *Continuous changes in specifications.*—Practically every one of the manufacturers doing business with the Government has suffered heavily from this evil. A glance at the "orders schedule" may show that different manufacturers have orders for months, but investigation shows that they have been held up for weeks and months by continual changes of specifications.

(3) *Not placing orders sufficiently large with running concerns to enable them to figure on expansion and to make permanent investments in buildings and machinery.*—This was true generally until six months ago, then only partially.

(4) *Lack of prompt action in arranging to have the Government assist manufacturers to finance their orders.*—This is beginning to be done. If it could be done more extensively and readily, it would more than double the production of aircraft and motors in the United States in the coming 12 months. The Curtiss Aeroplane & Motor Corporation, at Buffalo, is an example. This firm built a huge plant 1,600 by 900 feet at Elmwood Street, Buffalo, this summer, where there can be produced 500 aeroplanes a week. This firm has, besides a plant at Churchill Street, Buffalo, producing from 70 to 80 aeroplanes a week and capable of producing 100 a week. But the building of the new plant strained the financial resources of the Curtiss Co., and although the Government gave some financial assistance the amount was not sufficient. Now this plant is not working at even 25 per cent of its capacity.

(5) *Forcing manufacturers into idleness at intervals between orders.*—This is an evil that has not only caused waste of production facilities, but has resulted in aircraft manufacturers doing business with the United States at a financial loss.

If the manufacturers of aeroplanes and motors knew what type of machine they will have to produce two or three months before their present order is completed they would begin to get machinery, gigs, tools, and gauges, and materials ready. And their workmen would have future work to look forward to and would hasten the production of the orders at hand.

As it is the workman by going fast is somewhat in the position of hurrying himself out of his job.

PARTIAL LIST OF AEROPLANE AND PARTS MANUFACTURERS.

The following is a partial list of aeroplane and aeroplane parts manufacturers working for the United States Signal Corps, compiled from published lists of firms exempted from the Garfield general order and from other published items. It includes practically all the firms manufacturing for the Army and gives an idea of the class of firms engaged in this work. More than half had not done aeronautic work a year ago:

Curtiss Aeroplane Co., Buffalo, N. Y.
 Dayton-Wright Airplane Co., Dayton, Ohio.
 Fisher Body Corporation, Detroit, Mich.
 Springfield Aircraft Corporation, Springfield, Mass.
 Standard Aircraft Corporation, Elizabeth, N. J.
 Wright-Martin Aircraft Co., New Brunswick, N. J.
 California Aviation Co., 536 H. W. Hellman Building, Los Angeles, Cal.
 Fowler Airplane Co., 128 Twelfth Street, San Francisco.
 Sturtevant Aeroplane Co., Jamaica Plains, Mass.
 Thomas Morse Aircraft Corporation, Ithaca, N. Y.
 Rubay Co., Cleveland, Ohio.
 Liberty Iron Works, Sacramento, Cal.
 St. Louis Aircraft Corporation, Redwood City, Cal., and St. Louis, Mo.
 Breese Aircraft, Farmingdale, N. Y.
 Lawson Aircraft Corporation, Green Bay, Wis.
 A. S. Heinrich Corporation, 141 Broadway, New York City.
 Lewis Vought Corporation, Long Island City, Long Island.
 Glenn L. Martin Co., Cleveland, Ohio.
 Curtiss Engineering Co. (Navy aeroplanes) Garden City, Long Island, N. Y.
 Aeromarine Plane & Motor Co., Keyport, N. J.
 L. W. F. Co. (Navy work), College Point, Long Island.
 Burgess Co. (Navy Department), Marblehead, Mass.

Firms making wood and metal parts: Other firms making wood and metal parts for aircraft for the Army, either directly or indirectly, probably only half of the number actually employed, are:

Erie Specialty Co., Erie, Pa.
 Dayton Metal Products Co., Dayton, Ohio.
 John M. Rogers Works, Gloucester, N. J.
 Aluminum Castings Co., Cleveland, Ohio.
 Acklin Stamping Co., Dorr Avenue, Toledo, Ohio.
 Lewis Spring & Axle Co., Chelsea, Mich.
 W. H. Mullins Co., Salem, Ohio.
 National Gauge & Equipment Co., La Crosse, Wis.
 United States Gauge Co., Sellersville, Pa.

National Cash Register Co., Dayton, Ohio.
 Metz Co., Waltham, Mass.
 American Steel & Wire Co., Worcester, Mass.
 Burns & Bassick, Bridgeport, Conn.
 Federal Adding Machine Co., New Haven, Conn.
 Weber Knapp Co., Jamestown, N. Y.
 Edward C. Budd Manufacturing Co., Philadelphia, Pa.
 Newark Tube & Steel Co., Newark, N. J.
 Excelsior Meter Manufacturing & Supply Co., 3700 Cortland Street.
 Chicago, Ill.
 Saxon Manufacturing Co., Grand Avenue, Toledo, Ohio.
 Standard Metal Work Co., Thomsonville, Conn.
 Cutler Desk Co., Buffalo, N. Y.
 A. C. Clark Co., Chicago, Ill.
 Astoria Veneer, Mill & Desk Co., Astoria, Long Island, N. Y.

Firms making propellers:

West Woodworking Propeller Co., offices 1 Wall Street, New York City.
 United States Propeller Co.
 American Propeller Co., Baltimore, Md.
 Hartzell Walnut Propeller Co., Piqua, Ohio.
 Flattorp Manufacturing Co., Chicago, Ill.
 United States Propeller Co., 120 Broadway, New York.

MOTORS BEING MANUFACTURED IN THE UNITED STATES.

The aeroplane motors being manufactured in the United States at present may be divided into two separate classes, as follows:

(1) *Motors adapted for preliminary training and small combat type aeroplanes for advanced training.*—(a) The Curtiss 100-horsepower motor, being used largely for preliminary training aeroplanes and manufactured by the Curtis Aeroplane & Motor Corporation, of Buffalo, and the Willys-Overland Co.

(b) The Hall-Scott 125-horsepower motor, being used on some of the preliminary training aeroplanes. The Hall-Scott Motor Car Co., San Francisco, Cal.

(c) The 100-horsepower Duesenberg motor, suitable for preliminary training, manufactured by the Duesenberg Motor Co., 120 Broadway, New York.

(d) The Gnome 100-horsepower and 150-horsepower (rotary) motor, suitable for advanced training, manufactured by the General Vehicle Co., Long Island City, N. Y. Government took over the plant recently.

(e) The Le Rhone 80-horsepower (rotary) motor, suitable for small combat planes for advanced training, being manufactured by the Union Switch & Signal Co., Swissdale, Pa.

(f) Besides these there are the Sturtevant, Thomas-Morse motor, Wisconsin motor, Roberts motor, Union Gas-Engine motor, the Cleveland motor, and several others.

(2) *Motors adapted for bombing, fighting, and practically all types of single or double or triple motored aeroplanes.*—(a) Liberty motor, 12 cylinders. It is understood that orders for about 30,000 of these motors have been placed. Maj. Vincent stated at the S. A. meeting on January 10 that the production on that date was five motors per day. They are being manufactured by the Packard Co., Detroit, Mich.; Ford Motor Co., Detroit, Mich.; General Motors, Detroit, Mich.; Lincoln Motor Co., Detroit, Mich.; Trego Motors Corporation, New Haven, Conn.; Nordyke & Marmon Co., Indianapolis, Ind.

(b) Hispano-Suiza, 200 horsepower and 350 horsepower. It is generally understood that orders for 4,000 of these motors have been placed by the United States Government with the Wright-Martin Co., New Brunswick, N. J.

(c) Bugatti motor, 16-cylinder, 510 horsepower, weighing only about 1,050 pounds. Considered as an extremely good motor and easy to manufacture by the French authorities. Being manufactured by the Duesenberg Motor Co., 120 Broadway, New York. It was stated at the S. A. E. meeting the order is for 2,000 motors of this type.

(d) Rolls-Royce parts being manufactured by Stearns at Cleveland, Ohio, for the British Government.

(e) Sunbeam (British), a few manufactured by the Sterling Co., of Buffalo, N. Y.

(f) Kessler, a promising motor being developed at Detroit. Has not yet reached the manufacturing stage.

(g) Sturtevant, 210 horsepower, weighing little over 2 pounds per horsepower, being manufactured by the B. F. Sturtevant Co., Hyde Park, Boston, Mass.

(h) Benetti, about 500 horsepower. It has been stated that 18 are being built by Robert Garrette & Co., Baltimore, Md. They are being built in France by the Franco-British Aeronautic Co.

(i) Duesenberg, 350-horsepower motor, being developed by the Duesenberg Motor Co., 120 Broadway, New York.

(j) Knox motor, about 350 horsepower. First built in 1916, gave promising results. Built by the Knox Motor Co., Springfield, Mass.

Thomas Morse, Thomas Morse Aircraft Corporation, Ithaca, N. Y.

THIRTY BOAT MANUFACTURERS WHOSE PLANTS ARE PARTLY OR ENTIRELY IDLE AND COULD TAKE, AEROPLANE BUSINESS.

Now that manufacturing of pleasure boats has ceased, the manufacturers of pleasure boats are all practically idle; and as they have facilities for manufacturing aeroplane parts and pontoons for the hydroaeroplanes needed by the Army for coast defense, manufacturers of aeroplanes can place orders with them and thereby increase production. Following is a list of 30 boat builders whose facilities are available for manufacturing aeroplane parts. One, W. H. Mullins Co., of Salem, Ohio, has been given orders for parts and has shown that such plants as theirs are adapted for manufacturing aeroplane parts:

Albany Boat Corporation, Watervliet, N. Y.
 Belle Island Boat & Engine Co., Detroit, Mich.
 Britt Bros., West Lynn, Mass.
 Brooks Manufacturing Co., Saginaw, Mich.
 Burger Boat Co., Manitowoc, Wis.
 Church Boat Co., Sibley, Mich.
 Dachel Carter Boat Co., Benton Harbor, Mich.
 Deering Boat Manufacturing Co., Madison, Wis.
 Elco Co., Bayonne, N. J.
 Great Lakes Boat Building Corporation, Milwaukee, Wis.
 Greenport Basin & Construction Co., Greenport, N. Y.
 Hasker, John L., Boat Co., Detroit, Mich.
 Herreshoff Manufacturing Co., Bristol, Mass.
 Jacob, Robert, City Island, N. Y.
 Lawley, George, & Son Corporation, Neponset, Mass.
 Luders Marine Construction Co., Stamford, Conn.
 Matthews Boat Co., Port Clinton, Ohio.
 Mathis Yacht Building Co., Camden, N. J.
 Mullins, W. H., Co., Salem, Ohio.
 Niagara Motor Boat Co., North Tonawanda, N. Y.
 Noch, F. S., East Greenwich, R. I.
 Purdy Boat Co., Miami Beach, Fla.
 Red Bank Yacht Works, Red Bank, N. J.
 Reliance Motor Boat Co., New York City.
 Renaud Boat Works, Detroit, Mich.
 Richardson Boat Co., North Tonawanda, N. Y.
 Ruddock Yacht Works, New York City.
 Smith, C. C., Boat & Engine Co., Algonac, Mich.
 Toppan Boat Manufacturing Co., Medford, Mass.
 Valley Boat Co., Saginaw, Mich.

HUNDREDS OF MANUFACTURERS READY TO TAKE UP MANUFACTURE OF AIRCRAFT, MOTORS, AND PARTS.

There are hundreds of manufacturers ready to take up the manufacture of aircraft, motors, and parts.

In the automobile industry alone there are scores of large manufacturers ready to take orders.

That is also true of the motor-boat and marine-engine manufacturers and of piano and furniture manufacturers.

Present known manufacturers of aircraft or motors receive letters daily from manufacturers who have plants with trained labor and machinery and could immediately manufacture certain parts.

For special rush engine work such firms as the Peerless Car Co., the Wisconsin Motor Manufacturing Co., that are now making trucks, would be best fitted.

Firms that assemble cars like the Fiat Co., of Poughkeepsie, N. Y., are practically idle. They have facilities which can be used.

BEST RESULTS OBTAINED BY GIVING ORDERS FOR COMPLETE AEROPLANES AND MOTORS TO FIRMS ALREADY MANUFACTURING THEM, LEAVING TO THEM TO CONTRACT FOR PARTS.

As a general policy it is best to give orders for complete aeroplanes and motors to firms already manufacturing them, leaving it to them to place contracts with miscellaneous manufacturers for parts.

This is best because every aircraft or motor manufacturer has an organization that keeps in close touch with "neighboring" or allied factories and has scores of requests for business from plants that have a certain amount of machinery, tools, and trained labor, but not enough to make complete machines. An aircraft manufacturer can easily assign some experts to direct the activities of plants making parts and by using such plants can easily double the output in a few weeks without causing added burden to the Government. This insures proper supervision of the manufacturing of parts, eliminates the necessity on the part of the Government to put sets of Government bookkeepers and accountants in small factories, which it was found impossible to do, and permits utilizing large and small idle plants to increase the production of aircraft and motors.

AMPLE MANUFACTURING FACILITIES FOR PRODUCING THE 250,000 MOTORS NEEDED TO CARRY OUT THE PROGRAM WITHIN 12 MONTHS.

The United States has more than sufficient manufacturing facilities to produce the 250,000 motors needed to carry out the program within 12 months. The writer has discussed the matter with a number of large manufacturers, and they agreed in this, but they were unanimous in saying that this can be done only if orders are placed immediately and there are no changes made in the specifications after the orders are placed.

LARGE AMOUNT OF MACHINERY NOW PRACTICALLY IDLE CAN BE USED FOR AIRCRAFT PROGRAM.

There is a large amount of machinery now practically idle in large and small factories that can be employed to carry out the aircraft program.

Some of the aircraft and motor manufacturers themselves know where to find it. In some cases it is not machinery that could be specified for aircraft and motor manufacturers, but the aircraft manufacturers can adapt it for their use.

As this was being written the writer received a call from Mr. N. C. Rost, the general manager of the Duesenberg Motor Co., of 120 Broadway, New York. I took the opportunity of putting this statement to a test, and inquired: "Mr. Rost, I know that your firm has a fair-sized order for motors, but I would like to know what you would do if the order that you have were increased fivefold, said increase to be produced at practically the same time as the original order? What would you do if you got your order increased fivefold?"

Mr. Rost's answer was that he would arrange with a certain number of firms, which he named, and which are practically idle, to make certain parts; would secure certain machinery from certain factories, which he again named; would get the gigs, tools, dies, and gauges made by certain firms, including small local firms, which he again named. And he enumerated many factories and concerns which he would use if the order were increased more than fivefold.

With his intimate knowledge of the situation, of factories and people who run the factories, Mr. Rost would, therefore, be in a position to increase production quicker in a month than a Government committee or board could do in six months.

During the conversation Mr. Rost mentioned that there is a lot of valuable machinery suitable for aircraft and motor manufacturing in Brooklyn, where it has been for many months, waiting shipment for Russia. Arrangement may be made to secure this machinery for our use.

Mr. K. B. McDonald, general manager of the Curtiss Engineering Co., Garden City, N. Y., agrees with Mr. Rost, as does Capt. Blair, of the Springfield Aircraft Corporation, Springfield, Mass., who was one of the organizers and partly responsible for the efficiency of the Canadian Aeroplanes (Ltd.).

LIST OF 41 MANUFACTURERS OF MARINE ENGINES WHO ARE PARTIALLY IDLE DUE TO THE DISCONTINUANCE OF THE BUILDING OF PLEASURE BOATS WHO CAN MANUFACTURE PARTS FOR AERONAUTIC MOTORS.

Now that the manufacture of pleasure boat engines is practically at a standstill the manufacturers of boat engines are partially idle and are ready to take up the manufacture of parts for aeronautic motors. Some are also equipped to undertake to build complete motors. Manufacturers of aeroplane motors who are given large orders can turn to manufacturers of boat engines to make parts, therefore greatly increasing their production. Herewith is the list of 41 marine engine builders who can take orders for aero motor parts:

Automatic Machine Co., Bridgeport, Conn.
 Bridgeport Motor Co. (Inc.), Bridgeport, Conn.
 Buffalo Gasoline Motor Co., Buffalo, N. Y.
 Cottrell, C. B., & Sons Co., Westerly, R. I.
 Doman, H. C., Co., Oshkosh, Wis.
 Erd Motor Co., Saginaw, Mich.
 Fay & Bowen Co., Geneva, N. Y.
 Ferro Machine & Foundry Co., Cleveland, Ohio.
 Frisbie Motor Co., Middletown, Conn.
 Fulton Manufacturing Co., Erie, Pa.
 Goldie, William (Pierce-Budd), Bay City, Mich.
 Gray Motor Co., Detroit, Mich.
 Gray & Prior Machine Co., Hartford, Conn.
 Kermatch Manufacturing Co., Detroit, Mich.
 Lathrop Co., Mystic, Conn.
 Lycoming Foundry & Machine Co., Williamsport, Pa.
 Maximotor Co., Detroit, Mich.
 Mianus Motor Works, Stamford, Conn.
 Miller Engine Co., Chicago, Ill.
 Niagara Motors Corporation, Buffalo, N. Y.
 Northwestern Motor Co., Eau Claire, Wis.
 Palmer Bros., Cox Cob, Conn.
 Peerless Marine Motor Co., Buffalo, N. Y.
 Red Wing Motor Co., Red Wing, Minn.
 Regal Gasoline Engine Co., Coldwater, Mich.
 Roberts Motor Co., Sandusky, Ohio.
 Scripps Motor Co., Detroit, Mich.
 Smally General Co., Bay City, Mich.
 Standard Motors Construction Co., Jersey City, N. J.
 Stanley, Co., Salem, Mass.
 Sterling Engine Co., Buffalo, N. Y.
 Torrington Co., Torrington, Conn.
 Union Gas Engine Co., Oakland, Cal.
 Universal Motor Co., Oshkosh, Wis.
 Van Blerck Motor Co., Monroe, Mich.
 Winton Engine Works, Cleveland, Ohio.
 Wisconsin Motor Manufacturing Co., Milwaukee, Wis.
 Defor Boat & Motor Manufacturing Co., Bay City, Mich.
 Gas Engine & Power Co., & Chas. Seabury (Cons.), Morris Heights, N. Y.
 Murray & Trogurtha, South Boston, Mass.
 New York Launch & Engine Co., Morris Heights, N. Y.

UNITED STATES HAS PLENTY OF STEEL, SPRUCE AND FIR, FABRIC, AND OTHER MATERIALS NEEDED FOR MANUFACTURING 100,000 AEROPLANES AND 200,000 MOTORS IN 12 MONTHS.

The practical men and authorities who specialize in getting and producing aeroplane steel, spruce and fir, fabric for covering aeroplanes, and other materials are unanimous in stating that the United States' resources can more than meet the demand for these materials for manufacturing 100,000 aeroplanes and 200,000 motors in the coming 12 months, provided that practical men, well

acquainted with each industry, as well as with the requirements, are placed in charge of getting these materials.

Appreciating the fact that Mr. F. G. Diffin, the chairman of the international aircraft standardization committee of the Council of National Defense, would be one of the best authorities on possible production of aeroplane steel, the writer asked Mr. Diffin whether he anticipated any difficulty in getting the amount of steel needed for the program. He was positive that there would be no difficulty.

Mr. Diffin is leaving for London, where he is to attend the international aircraft standard conference, which is to take place in the middle of February. With him are going a number of Army and Navy officers and authorities in different fields. The purpose of the conference is to standardize the material and products that go into aircraft, so that the requirements of all the allies will be identical—which will make production in the United States easier.

DELAYS IN GETTING AIRCRAFT STEEL DUE MAINLY TO DELAY IN PLACING ORDERS.

The difficulty has not been to get the suitable steel, but, rather, to get the suitable steel in less than six to eight weeks, because it usually has been produced to order, and the orders are seldom large enough to justify the mills to give special attention to them. Aeroplane manufacturers have been unable to place larger orders for steel because they have had no certainty that the next order for aeroplanes will be for machines of the same type. If the War Department were to adopt a policy of letting the manufacturers know two months or three months before the completion of an order just what their next order is to be, the manufacturers would have time to order the required steel as per the Government specifications and therefore prepare in advance.

The average steel mill requires about six weeks to deliver an order for special steel, but if a standing order is placed for constant delivery, it is always possible to fill a "rush" order in a few days, so that a factory will not be held up if a shipment of steel happens to be faulty.

One of the principal causes of delay in the past 12 months has been—next to the delays caused by continuous changes in the specifications—the fact that one of the materials required to produce machines or motors failed in some way, holding back an entire order.

An arrangement should be reached between the Government and the manufacturers whereby the manufacturers will order between 20 and 40 per cent more materials than they need to produce a given number of machines or motors, so that in the event that part of the shipment proves to be faulty, or the estimate of the amount needed was incorrect, or anything else happens to spoil part of the material, there will be a sufficient reserve to complete the order, thereby eliminating the necessity of keeping a large factory idle through lack of one of the materials. For instance, the writer has been advised that one of the aeroplane factories making machines for the Army was held up in its production because a lot of lumber deteriorated in the progress of drying in kilns. This is an unusual happening, but it happened, and delayed the production of hundreds of machines while other lumber was secured.

UNITED STATES AND CANADA HAVE SUFFICIENT TIMBER FOR MANY YEARS TO COME.

The spruce committee of the Aero Club of America, of which the writer is chairman, recently made a report with suggestions. This report states that the allies will need 50,000,000 feet of aeroplane spruce a month and that the United States and Canada have enough spruce timber to supply spruce lumber to the allies for many years to come. The committee also makes recommendations regarding the methods to be pursued to solve some of the most difficult problems connected with increasing the production of aeroplanes.

This report is given in the appendix, marked C.

There is only a total of 200 feet of spruce in the average size aeroplane, but it takes at times many thousands of feet to get the 20 feet needed, owing to the crossgrain, knots, etc.

Whether it will take 500 feet or 5,000 feet of spruce lumber to get the 200 feet needed depends on how it is cut. At present practically all aeroplane spruce is cut uniformly, to comply with specifications issued by the Signal Corps some months ago. They are made with the cooperation and advice of able representatives of lumbermen, but who did not know aeroplane requirements. These specifications are now being revised. It is hoped that the revl-

sion will take into consideration the sizes of machines to be built and eliminate the waste involved in requiring all aeroplane spruce lumber to be 3 inches thick, whereas for the average size of machines it can be used in sizes ranging from 1½ inches up. Making this change will probably double the amount of aeroplane spruce that can be gotten from a spruce log.

The amount of spruce timber available is enormous and far exceeding the needs of the allies for many years. Then there is an enormous amount of fir or Oregon pine, which is a good substitute for spruce.

As a result of the publication of part of Mr. Hawley's letter to Mr. Coffin (given in full in the report, Appendix C), a number of communications were received from people who have large spruce-timber holdings.

Mr. Robert H. Paid, Commercial Trust Building, New York, called on the writer and presented evidence that he controls over 5,000 acres of timber holdings and has the necessary finances and organization and is ready to supply millions of spruce logs or spruce lumber or laminated wood.

Mr. Dwight Brannan, of 15 William Street, New York, wrote that he had written to Mr. Howard E. Coffin as follows:

"My attention to-day is called to the fact that there is a shortage of 8,000,000,000 feet of spruce timber per month required by the Government to make aeroplanes. I desire to state that I have a forest used as a park on my place of 400 acres in Maine and have spruce trees carefully cultivated for the last 100 years, straight and tall, with no limbs within 30 feet of the ground, which I will sell to the Government in this emergency. If you will designate an inspector to examine the same, I will go down with him and place it at once at the Government's disposal, as an aeroplane fleet is a vital necessity at once to win the war."

Mr. Charles H. Fisher, lumber distributor, 170 Summer Street, Boston, Mass., wrote as follows:

"I noticed in one of to-day's Boston papers an article to the effect that the spruce needed for the aeroplanes of the United States can not be turned out by the lumbermen at the prices fixed by the Government. By this I suppose is meant the lumbermen of Washington and Oregon. The article further stated that the problem might be solved on a 10 per cent basis.

"I shall have the selling in the East of a large spruce mill now being erected in British Columbia and which will be in operation in a very few weeks. The spruce from this will be of a finer texture than that grown farther south, because of the growing season being shorter, on account of the colder weather, so that it does not grow so fast.

"No contract for the aeroplane spruce from this mill has been made as yet, and we will make a specialty of aeroplane spruce. We are looking for the best price possible, and would be pleased to have you advise us of the specifications and grade required and the highest price you would pay per M feet, either at the mill or delivered. The freight to Boston and New York points is about \$25 per M feet. Hoping to receive an early reply, making an offer which I can submit to my mill people, I am,

"Yours, very truly,

"C. H. FISHER"

W. H. Blumb & Son, of North Bangor, N. Y., wrote that they have a lot of spruce and will supply it in logs.

Two hundred and ten million feet of spruce and 210,000,000 feet of fir timber to be offered to the Signal Corps by one man.—Mr. Charles Widrig, living at the Hotel Walcott, New York City, for a few weeks, wrote me under date of January 26, as follows:

"MY DEAR MR. WOODHOUSE: I have just returned from Portland, Oreg., and have made a thorough investigation of the spruce conditions as they exist to-day.

"I was prompted by the Signal Corps in Washington to endeavor to assist in producing spruce, which they are badly in need of. I have secured an option on 6,000 acres of what is considered the best stand of spruce in the United States to-day. This timber is located in Tillamook County, Oreg., on the Pacific Ocean, with a deep-water harbor and a branch of the Southern Pacific Railroad running through same.

"I have an option to purchase this property for \$500,000. It contains 210,000,000 feet of fir, hemlock, cedar, and spruce, running 60 per cent spruce. This is a trifle more than \$2.50 per thousand, which, considering its accessibility, is considered the cheapest piece of timberland I know of to-day.

"Officers of the Signal Corps have advised and written me that the spruce-production department at Portland are anxious to contract with me to produce the spruce for aeroplane construction that is now located on this tract of timber. They have also stated that they would take a certain proportion of the fir for beams and a majority of the balance for ship lumber. The Crown Willmet Paper Co., of Oregon City, have agreed to take all of the residue spruce and all of the hemlock for paper pulp.

"I will utilize the cedar in a knock-down house plant, which I propose combining with this proposition, to produce the houses the Government will need for France; in fact, every different commodity on this tract I can readily find a market for.

"I have a tentative organization; that is to say, a reliable expert logger, who is able and willing to contract to do the entire logging of this tract of timber. I also have in this city one of the best and practical lumber men, who is willing to take a working interest in this proposition and manage the mill and lumber end.

"The terms of my option on this property are one-fourth cash. The Signal Corps has written me that a law was passed on October 6, 1917, empowering the War and Navy Departments to advance 30 per cent on any contract for war purposes. I consider that there is at least 100,000,000 feet of spruce on this tract of timber and that 20 per cent will cut aeroplane spruce that will pass the Government inspection. Therefore I do not hesitate to contract with the Signal Corps for 20,000,000 feet of aeroplane spruce at \$105 per thousand or a total of \$2,100,000. The advance of 30 per cent would be \$630,000, which would be quite ample to finance the whole project.

"I want to request you, if you will see your way clear to interest yourself in my behalf, to endeavor to find some responsible financier in this city, who is able and willing to put \$150,000 in this project."

Mr. Widrig was sent to me by a person who knows that I have arranged the financing of a number of aeronautic concerns and that I have never accepted fees for financing firms or giving business advice.

If the tremendous call on my time permits, I will get somebody to finance this proposition in the near future.

SPECIAL COTTON AND OTHER FABRICS CAN BE MANUFACTURED IN THE UNITED STATES FOR COVERING AEROPLANES.

A great deal has been said and printed about the so-called problem caused by the shortage of linen for covering aeroplanes.

The lack of linen can hardly be considered as a serious problem, because linen is not essential for the covering of aeroplanes.

The employment of linen for covering aeroplanes is essentially a practice handed down by tradition, based on the fact that the linen is stronger for a given weight than cotton or other fabrics.

That strength does not add anything to the strength or efficiency of the aeroplanes that is necessary for any special purpose. Special cotton or other fabrics can be used for covering aeroplanes, particularly military aeroplanes, the life of which is comparatively short.

The matter of obtaining special cotton or fabric for covering aeroplanes is easily solved, providing orders are placed for its production. There are a great many mills and producers of fabrics that could undertake to turn out large quantities of special fabric suitable for covering aeroplanes if orders were given to them in sufficient quantity to enable them to make the necessary arrangements for same.

It has been reported to me that there are linen, cloth, and carpet factories that have had to close down for lack of orders that have suitable machinery and trained workmen. It is comparatively easy to verify whether this is the case.

OFFICIAL ORGANIZATIONS THAT HAVE CHARGE OF CARRYING OUT THE AIRCRAFT PROGRAM AT PRESENT AND THEIR LIMITATIONS IN SCOPE AND POWER OF DECIDING AND CARRYING OUT THE PROGRAM.

The following organizations have charge of deciding upon and carrying out the aeronautic program for the United States:

(1) The joint Army and Navy aircraft committee established in Paris under the direction of the United States Aircraft Board to coordinate the activities

of the United States Army and Navy in foreign territory and to form a direct channel of contact between the interallied aviation committee and the Aircraft Board.

This committee deals with priority rather than with policy. It advises what types of machines and motors are wanted first, but it has not formulated policies looking ahead to extensive aerial operations.

This committee is limited in its outlook and in its power. It carries out the policies decided by the different Governments rather than recommending policies to the Government. Its main responsibility has been to supply the best types of machines to meet the various changes of conditions on the western front rather than to consider the aeronautic needs of the allies as a whole, to meet possible conditions in the near future, and deciding on substantial aeronautic programs to meet these conditions.

(2) *The United States Aircraft Board.*—This board was created by act of Congress, approved by President Wilson on October 1, 1917. It superseded the Aircraft Production Board created by the Council of National Defense in May, 1917, the members of which were Howard E. Coffin, chairman; Brig. Gen. George O. Squier, Chief Signal Officer; Rear Admiral D. W. Taylor, Chief of Bureau Construction, United States Navy; Mr. E. A. Deeds, who later was given a commission as colonel in the Signal Corps; S. D. Waldon, who later became colonel in the Signal Corps; and R. L. Montgomery, to serve as financial and business advisor of the board, who later also became colonel in the Signal Corps.

The Aircraft Board as constituted at present consists of Mr. Howard E. Coffin, chairman; Maj. Gen. George O. Squier, Chief Signal Officer, United States Army; Rear Admiral D. W. Taylor, Chief of Bureau of Construction, United States Navy; Col. E. A. Deeds, Signal Corps; R. L. Montgomery, Signal Corps; R. F. Howe; and two subordinate naval officers whose rank is not high enough to permit them to decide on matters of policy.

Mr. Howard E. Coffin, the chairman, stated the position of the Aircraft Board in an address delivered at the Society of Automotive Engineers on January 10. The statement read as follows:

"The Aircraft Board is a coordinating influence between the War and Navy Departments. It does not, within itself, execute orders; it is an advisory body. There sit upon this board the executive members of both War and Navy Departments as related to aircraft development. The determination of policy upon the part of the board is put into execution through the duly organized departments of the Government and not through any organization built up under the board. Consequently the actual task of putting these policies into execution and of putting designs of engines and aeroplanes into quantity production in this country are functions of the duly constituted governmental departments. The War Department is charged with the actual execution of the orders; the Navy Department is charged with a similar authority and responsibility. The board is by law charged with supervision and advisory powers, but is prevented from building up any organization under itself for executive work.

"To quote from the act of Congress establishing the Aircraft Board:

"It is created for the purpose of expanding and coordinating the industrial activities relating to aircraft or parts of aircraft, or products for any purpose in the United States, and to facilitate generally the development of the air service—that the board is hereby empowered under the direction and approval of the Secretary of War and the Secretary of the Navy to supervise and direct in accordance with the requirements prescribed or approved by the respective department, the purchase and manufacture of aircraft engines, etc.

"*Provided*, That the board may make recommendations as to contracts and their distribution in connection with the foregoing, that every contract shall be made by the already constituted authority of the respective department.

"*Provided further*, That, except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy, there shall not be established or maintained under the board any office or organization duplicating in whole or in part any office or organization now existing that can be properly established or maintained by appropriation made for or available for the military or naval services."

"Theoretically, the Aircraft Board is charged with advisory powers in connection with the industrial development of the aircraft industry. It is not, by congressional enactment, charged with any responsibility in connection with the military side of the program, but, being constituted by the executive officers

of both services, the board has automatically come to be the clearing house in which are determined or discussed many of the military policies. These include the question of the training of aviators, the training of mechanics, the construction of the great flying schools that are going up almost over night in the various parts of the country, and with many other lines of work not properly connected with the industrial development as such."

(3) The Aircraft Board is assisted by a number of committees, including the joint Army and Navy committee, which deals with technical matters, and the international standardization board, which deals with the standardization of materials for aircraft, the national advisory committee on aeronautics, which deals with investigations, experiments, and matters of similar nature.

LIMITATIONS OF THE JOINT ARMY AND NAVY COMMITTEE IN PARIS.

The limitations of the joint Army and Navy committee are that it deals with priority and with technical details of machines rather than with making of programs and deciding on policies.

As a matter of fact, as also stated in the House of Lords recently, during the discussion of the future activities of the newly created British air ministry, Great Britain has never had an active aeronautic policy nor an aeronautic program aiming to do more than having an air service to act as an auxiliary service to the army and navy.

Until the creation of the air ministry with Lord Rothermere as air minister, the British authority always opposed the idea of bombing Germany. Therefore they did not sanction the construction of large aeroplanes for bombing purposes over long distances, and the large Handley Page was built without the sanction of the authorities, and the construction of a fairly large number was not sanctioned until many months later.

For bombing over short distances they held that, technically speaking, smaller aeroplanes are better, as they can be operated quicker, and if they do not carry a large load of bombs it was expected to be able to make up this difference by sending a larger number of machines.

This policy limited the bombing to German possession on Belgian soil, and that failed to strike the fear of God in the German heart as bombing of German bases on German soil and destroying the bridges on the Rhine would have done.

Lord Rothermere, the new British air minister, has adopted a policy of bombing Germany, but the air ministry is still being organized.

France has followed closely the policy—or lack of policy—of Great Britain. With France it was not a choice; time is necessary, as she had to depend upon Great Britain for assistance in getting materials for the construction of aircraft as well as cooperating in actual operations.

Italy was the only country that looked ahead and developed the large Capronis with which to meet conditions of modern warfare. But until the late summer of 1917 the French and British authorities did not take steps to supply the material and coal needed by Italy, and that country was limited in her production through lack of materials and coal. The Italian authorities did not have voice in the allied councils.

The joint Army and Navy committee is also limited by the following considerations:

(a) Being so close to the problem of limited tonnage and tremendous demands for different supplies, it must ask only for what it needs immediately and vitally.

(b) The few officers on that committee are so pressed by the accumulation of details and routine work that they do not have the time to consider plans and make plans looking ahead to possible changes in the situation and steps to be taken to meet the changes.

(c) We are under the impression in the United States that all the factories that can possibly turn out aeroplanes and motors are doing so and do not know that we have manufacturing facilities practically idle that could enable the United States to produce 100,000 aeroplanes and 200,000 motors within one year after placing the orders.

(d) Being under the impression in the United States that we are utilizing every bit of our available resources and manufacturing facilities they do not dare to propose the production of such things as huge machines for the crossing of the Atlantic, fearing that if they did so they would delay the production of the smaller aeroplanes which are so badly needed at present.

(e) Owing to continual changes of reports of allied countries the committee is continually giving different advices regarding different types of machines that should be adopted by all hands with the carrying out of the present program, and although it gathers new viewpoints constantly it has to establish relations with new officers, which involves the spending of weeks in dealing with the new officers in our perfunctory way before it is really possible to express opinion, if the opinion involves the proposal of something which is not an absolutely accepted practice. A parallel in naval matters would be to have a committee which deals only with submarine chasers but never gets to consider the necessity or advisability of building battleships and the number to build to meet possible developments.

LIMITATIONS OF THE AIRCRAFT BOARD.

The limitations of the Aircraft Board are:

(1) The fact that it is, as stated by Mr. Coffin in the preceding statement, only an advisory body without power either to carry out its own decisions or to build the organization needed to carry out its own decision or to collect information necessary for making substantial plans and programs.

(2) Most of the members of the Aircraft Board have other important duties to perform, and can only give to the duties of the Aircraft Board a fraction of their time.

For instance, it is absolutely necessary that the Navy be represented on the board by an admiral having charge of aeronautics, so that he can effectively represent the Navy on the board and supervise the carrying out of the decisions in so far as they affect the Navy. Rear Admiral Taylor, the Chief of the Bureau of Construction, has all the necessary qualifications, but, being the Naval Constructor, having to look after the construction of all the ships of the Navy, he already has more work in connection with the ships than any one man can humanly do. He gives his entire time to the ships and can only give a fraction of his time to aircraft, and even then he must rob the ships of a fraction of his time to the consideration of aeronautic matters.

(3) The Aircraft Board as constituted had neither the organization nor the time necessary to master the different aspects of the problems connected with the building of the air forces. In other words, it meant to outline plans rather than to consider plans already outlined with all the details thoroughly worked out and all the data available on subjects to be discussed.

(4) The Aircraft Board's plans are still practically the same plans that were made at the time when Italy was victorious and Russia was still in the war. The plans have changed so far as the type of aeroplanes are concerned, but have not changed materially in extent.

PROBLEMS THAT MAY ARISE TO RETARD CARRYING OUT THE PROGRAM AND HOW THEY CAN BE SOLVED PARTIALLY OR ENTIRELY.

The problems that may arise to retard the carrying out of the program for the manufacture of 100,000 aeroplanes and 250,000 motors in one year and the possible, entire or partial, solution are as follows:

(1) *Labor trouble.*—This possible trouble can be placed under three headings, as follows: (a) Getting trained labor, (b) keeping trained labor, (c) getting labor to speed up production, (d) prevention of strikes, (e) training labor.

Getting trained labor.—Getting trained labor involves getting the trained men and women from where they may be and placing them where they are needed, as well as training unskilled labor.

There are a large number of available trained woodworkers, pleasure-car makers, piano makers, furniture makers, marine-engine makers, automobile body makers, and other such skilled labor badly needed in the manufacture of aircraft and motors. They are connected with factories that are practically idle, and have been waiting developments, disliking to change chief product or move their families. They are not sure that they would be of service in connection with aeronautics—and there is always sufficient talk about peace to make them feel that business will soon be in its normal state again.

This labor is not easy to persuade to make a change of position, but it can be had in carrying out the plan of giving larger orders to present aircraft and motor manufacturers, leaving it to them to place orders for parts with the partly idle factories.

Once these workmen find that they can make aircraft and motor parts it is easier to get them to go to aircraft factories.

The Government can help this situation by making lists of all such concerns that are practically idle and advising the manufacturers of aircraft and aero motors of them and also that it approves giving orders for parts to such firms as far as the plan makes for speeding up of production.

Keeping trained labor.—The aeroplane factories working for the Government are troubled to a great extent. Several of the manufacturers have told me that they engaged trained labor, but could not keep these workmen because of the lack of housing facilities in the community. These trained men came for positions and were efficient, but they soon left because there were no proper housing facilities near the factory where they could bring their families. The head of one of these firms, who received an application for a position from a thoroughly experienced motor maker, asked him why he had left the various large motor manufacturers whom he gave as reference. The man replied that it was impossible for him to find a place for his family to live near those factories where he had gotten a position, and therefore he left and was looking for another position.

It is evident, therefore, that one of the problems that must be solved so as to insure production is that of looking after the welfare not only of the workmen, but of their families, solving their economic problems for them as far as possible. This can be done either by the Federal Government or by the chamber of commerce or manufacturers' association or by a committee of the manufacturers themselves. The cooperation of real estate people can be enlisted to make and keep a complete inventory of housing facilities, their location, rental, etc., in every city and industrial center. The manufacturer can then send his workmen to this committee and arrange to provide lodging and housing for workmen and their families. If there be no lodging and housing facilities, it will not be hard to arrange with the chamber of commerce or merchants' association and other local organizations and the real estate interests to put up additional houses. The workmen themselves can be counted upon to cooperate if some inducement is given, such as free or cheap building lots and small houses which they can purchase on the installment plan. There is hardly a workman with a family who does not appreciate the value of having his own home with a little garden. If he does not appreciate it, his family usually does, and the influence of his family will be as great in keeping him in a position as it now is great in taking him away from a position because there are not proper housing facilities near the factory.

Other action that can be taken to keep trained labor are discussed further on.

Getting labor to speed up production.—Getting labor to speed up production can best be done by giving him and his family a financial inducement, such as a bonus on increased production, following the plan established by the Canadian Government in speeding up the production of the Canadian Government aeroplane factory at Toronto. A bonus was given here to all the foremen for all increased production above a certain minimum. It was only given on the excess production of complete machines, thereby bringing about a very close cooperation of foremen of the different departments. It was found that whenever one of the departments failed to provide the necessary number of given parts needed to furnish and ship a given number of aeroplanes the other foremen would ask the foreman of that department why his department was late, and it would help to work out the problems of speeding up the production in that particular department.

It was also found that under that bonus arrangement the wives and families of the foremen took an interest in the increased production, because it meant a larger income to the family. Almost the first question that every foreman met when he went home was an inquiry from some member of his family as to how far ahead of the schedule the factory was and how many aeroplanes above the set number they were going to produce and the increase in income that they would get through this increase in production.

The home influence on these foremen was found to be stronger than any other influence. Instead of having their wives and families delaying work by expecting the head of the family to take them to entertainments on every occasion, or come home earlier, they encouraged him to give closer attention to the business in the factory and make greater efforts to increase the production, and thereby increase the size of the bonus.

The Canadian aeroplane factory kept a table on the walls of the different departments so that the foreman of each department knows whether the other

department was ahead or behind his department. Whenever a department was behind the other foremen would go and help the department out, because they knew they could not get the bonus until the aeroplanes had been completed and shipped.

This system was also found to be the greatest influence in keeping trained labor, because the foremen and the workmen alike could not get the bonuses for increased production until a given lot of aeroplanes had been completed and shipped. In the meantime they had already started on another lot, and they would not think of leaving as long as there was something owing to them.

The above system more than anything is responsible for the great production at the Canadian aeroplane factory, which was great in actual number of aeroplanes produced, as well as from the standpoint of number of aeroplanes produced per number of workmen.

Prevention of strikes.—Strikes are usually the results of causes, and it is hard to state how strikes can be prevented unless the cause of the strike is known. As a general rule, however, the combination of giving labor a square deal and some inducement, as mentioned in the preceding paragraph, and influencing his family through giving such inducements, prevents strikes.

Keeping labor busy six days of the week, and proving the above inducements, prevents idleness and discontent, and therefore goes far toward preventing the usual labor trouble which is caused by the I. W. W. Workmen whose minds are interested in their work and who are thinking in terms of increasing production so as to increase their own income, are not susceptible to artificial discontent, such as is created by the I. W. W. leaders.

Training labor.—Assuming that a certain percentage of new labor must be trained, it must be considered whether the labor to be trained should be mostly of men past the draft age, or women, or men who are of draft age but who can not be sent to France for a time anyhow, and who should be trained so that later they may be taken to make up the personnel of aero squadrons and to supply the staff for the hangars, repair, and construction factories.

An economic solution would be to employ a large percentage of men who are in the draft age and assigning them as enlisted men or noncommissioned officers. This, however, brings up the problems connected with conscripting labor and the possible difficulties due to labor's objection to having the competition of low-salaried enlisted men. Also, on the part of the enlisted men to do the same work that labor is doing for lower salaries. Therefore this matter must be considered from the standpoint of national policy.

But it would seem logical that whereas there must be provided between 15 and 25 mechanics and assistants for every aviator that is trained, and to give them efficient training would take the best part of six months, but in the meantime they would be good workmen, it would be beneficial to assign enlisted men and noncommissioned officers to the factories, thereby assisting any immediate shortage of labor.

(2) *Delays in getting materials.*—Delays in getting materials can be avoided to a great extent by anticipating the needs fully and taking immediate steps to provide substitutes in cases where a given material is scarce.

For instance, we know that to train the 10,000 aviators (about) pay for whom is being provided in the Signal Corps estimates will take an average of one preliminary training machine and one advanced training machine, and that it takes an average of six aeroplanes and from 12 to 20 motors per aviator to keep him on the fighting front for one year. Knowing that it will take about 100,000 aeroplanes, 250,000 motors, and 500,000 propellers of different types and knowing the different materials that go into making different types of machines, motors, and propellers, there can be figured out the rough total amount of different kinds of materials required.

By placing practical men in charge of getting different kinds of materials who know the subject thoroughly and are familiar with the country's sources of supply and know how to go about getting information about a given subject. It will be comparatively easy to take an inventory of the country's resources in materials needed for aeroplane construction.

Inventories must be taken quickly.—Delay changes conditions. Orders for materials must be placed quickly, as manufacturers can not wait. As has been stated in other sections of this report, we have enormous sources of supply for the principal materials used in the manufacture of aeroplanes and motors. We also have large manufacturing facilities practically idle. It is mainly a question of combining factors.

Captured German aeroplanes show that the Germans have substituted different grades of cotton for linen and fir and ash and other kinds of wood for spruce.

The only reason why we have not had more extensive substitutions is that most of the people now interested in aeronautics are new acquisitions, who do not know the fundamental principles of aeronautic engineering, and therefore do not know the part that different sections of an aeroplane play in making the aeroplane efficient and strong.

(3) *Above the number of training machines needed preference should be given to large machines which are not apt to grow inefficient while being manufactured.*—Above the number of training machines needed to train the 10,000 aviators preference should be given to the construction of large machines, which are not apt to grow inefficient while being manufactured.

Four general types of aeroplanes can be made to serve the 11 purposes for which aeroplanes are used in the present war.—In connection with the military operations aviators—including balloon pilots—in the present war are rendering the following services:

1. Bombing the enemy's bases, destroying railroads, trains, and enemy material.

This is done with bombing aeroplanes, self-sufficient or protected by fighting machines.

2. Fighting hostile aeroplanes, preventing them from making aerial reconnaissance, taking photographs of one's positions, directing the fire of their artillery. Small fighting aeroplanes are used for this purpose.

3. Reconnoitering, determining the strength of the enemy, its composition, disposition, and probable intentions. Aeroplanes of different types are used for this purpose.

4. Photographing the enemy positions, which photographs, by giving the accurate details of the enemy's position, permit conducting operations based on exact information, therefore affording the greatest chances of success. Aeroplanes and kite balloons are used for this purpose.

5. Directing artillery fire: This is done with both aeroplanes and kite balloons, and has become an exact science.

6. Contact patrol—coordinating the activities of the different arms during the attack: In this rôle the aviator becomes the master mind that watches over every movement of the enemy as well as of his own forces and transmits to his own forces information regarding the advance, retreat, and other movements of the enemy, directing the sending of reinforcements to the weak or threatened points, directing the fire of the machine-gun batteries as well as of the artillery. Aeroplanes of different types are used for this purpose.

7. Cooperating with the infantry and other arms in taking trenches by flying low over the trenches and attacking the enemy machine guns. Different types of one or two passenger aeroplanes are used.

8. Cooperating with the artillery and other arms by attacking the crews of hostile batteries with machine guns. Different types of one or two passenger aeroplanes are used.

9. Making attacks with bombs or guns against land forces to engage the enemy and distract his attention from operations which are about to be conducted; in other words, performing the functions of cavalry, which has been used but little along the western front.

10. Conducting aerial attacks with bombs and machine guns from the rear against enemy land forces to relieve the pressure being brought by the enemy's forces against any one point, or to wear down the strength of the enemy's land forces. Different types of battle planes are used for this purpose.

11. Preventing reinforcements from reaching the enemy, by flying far into the enemy lines, watching for trains and attacking them with bombs and machine guns. Different types of battle planes are used for this purpose.

All these 11 services can be rendered by four different types of aeroplanes, as follows:

(a) The small, fast, single or two-seater for combat, observation, contact patrol, and cooperating with other arms in operations.

(b) The two or three-seater, average size aeroplane for photography, directing artillery fire, "emergency" bombing over short distances, and similar purposes.

(c) Medium-size bombing machines of the size of the present day Handley Page and Caproni biplanes, for use in bombing by day and night within a radius of 200 miles.

(d) Large-size bombing machines for use in bombing by day and night beyond the radius of 200 miles.

The first of these four types changes constantly and can best be produced in France and Great Britain, which are nearer to the theater of war and can quickly make changes in design to incorporate latest developments or ideas obtained from captured German machines.

The second type is not so subject to change, but can also be manufactured in large quantities in France and England. The United States can send over the wood and metal parts and motors and propellers for these.

The third and fourth types are the types that do not lose efficiency, and can and should be manufactured in this country in large quantities. As they can be used for night bombing, they can always be used for that purpose, no matter what improvements may take place in the meantime. At night it is impossible for an aeroplane to see another in the sky, only 100 feet away: it is almost impossible for the searchlights to follow them and for the antiaircraft guns to hit them.

In the event of our having a large number of such aeroplanes on hand at the end of the war, they can be used for transportation of mail and express. Canada and South and Central American countries will gladly purchase a large number for use for transportation.

Therefore preference should be given to large machines, the larger the better.

(4) *Problem of delivering aeroplanes to France. Ten thousand large machines would occupy 1,000,000 ship tons of space.*—Parts for 10,000 aeroplanes can be shipped over, but the problem of delivering a large number of aeroplanes to France can be solved only by flying the machines across the Atlantic, because a complete large aeroplane occupies close to 100 ship tons. Even if the machines were all land aeroplanes, which occupy much less space than flying boats or hydroaeroplanes, the space occupied by each machine would not be less than 50 ship tons.

To fly the machines across the Atlantic sounds harder than it actually is when all the factors are considered. The writer is preparing a complete report on the subject, with a clear definition of the different problems to be solved to fly a large number of aeroplanes across the Atlantic, and the possible solutions. Much more preparatory work has been done on this work than is known even by people closely connected with the aeronautic movement.

Even Lloyd's refused to insure a prize for \$150,000 that the Aero Club of America wanted to offer for the trans-Atlantic flight. The insurance was only requested for a period of six months from February, 1918, but Lloyd's replied that the flight is practicable and that they expect that it will be done within the coming six months.

One fact is certain, and that is that the types of machines needed to attack Kiel and other German bases effectively are types capable of flying over a distance of 100 miles with a large load of bombs. Machines of such size—and the Italians are about to test a Caproni triplane even larger—can easily fly from New York to Newfoundland, and from Newfoundland to the Azores, and from there to France or England.

A large type designed by Caproni and one designed by Handley Page seem to be large enough to make the flight straight from Newfoundland to Ireland.

Supposing 1,000 war planes were to start from the allies' lines in a major operation against German bases. They would start from different stations, probably about 100 from each aerodrome, the machines following each other at intervals of 30 seconds.

Squadrons of 25 machines would probably be formed with a flight commander to each squadron, who would start first. The aviators of each squadron would follow as fast as possible, each aviator following the navigation lights of his squadron commander. A prearranged signal from the air station would tell the squadron commander when the last machine left the ground, and he would then, after a brief delay to give time to the machines to climb up, give the signal to fall in line, and the squadron would travel on in V formation. Every aviator would, of course, have studied the specially gotten up chart and would be familiar with the route—as it looks to the aviator from the air.

Thus they would travel the 275 miles between the allied bases and the main German naval base.

The distance would be covered in three or four hours, and then —? Then with the torpedo planes attacking the German ships from the sides and the bombs attacking from above, the hardest blow yet struck at Germany, the most effective blow in the fight for humanity's rights, would be struck!

Just as the Battles of Manila, Santiago, and Tshushima lasted only about an hour, so the battle of Kiel would be over in an hour, because the destruction of the German fleet from the air could make it possible for the allies' mine sweepers to sweep the German mines and open the way for the allies' ships to deal with U boats in their bases at close range. And Germany's naval power would be crippled thereby—and its total destruction would follow, through repeated raids on the less important U-boat bases.

Bombing of Germany's military bases on land and of the aerodromes at Johannistahl and other places near Berlin and other German centers would make the German public ask for protection, and that would force the withdrawal of German aeroplanes, guns, and gunners from the Western fronts, weakening the Germans there.

(5) *Absolute separation of the experimental from production and manufacturing necessary to avoid delays caused by excessive reliance on experiments.*—The different countries and our American manufacturers have found that absolute separation of the experimental from the manufacturing is necessary to avoid the delays caused by excessive reliance on experiments which were reported as concluded, whereas they were still in the experimental stage.

This condition caused great delays and trouble in Great Britain, and resulted in bitter public criticisms of the authorities in charge of the air service in 1912 and 1916. It finally was the principal cause of upsetting the British cabinets in 1916-17, and caused a great many changes of high administrative army officers before the evil was partly rooted out by the separation of the Government experimental aeronautic work from the production and manufacturing.

The writer has a copy of the report of the British investigation for reference.

(6) *Theoretical prejudices and notions that have caused long delays, and how to get over them.*—Aeronautics have been held back in the past by theoretical prejudices and notions, the like of which still exist, and new ones arise constantly.

The writer recalls how Prof. Newcomb "proved beyond question" that it would be "impossible" for a heavier-than-air machine to rise from the ground.

After the Wright brothers made their first flight, on December 17, 1903, and for five years, people all over the world disbelieved that an aeroplane could actually fly. Some admitted that it could rise, like a skipping stone, but would be unable to turn in the air. The reports of the Wrights' circular flights before 1908 were not believed, and the circle of Henri Farman in France in 1907 was held as being a stunt. Then, in 1908, Wilbur Wright proved beyond doubt in his flights in France that circling was part of flying. He took the word "impossible" out of the dictionary.

Only six years ago, when the Aero Club of America offered to order several aeroplanes to compete for the international aviation trophy, and required that the aeroplanes make a speed of 100 miles an hour, it was criticized very generally by people who held that aeroplanes could only be used for scouting and that for that purpose a speed of from 50 to 60 miles per hour was best. They held that beyond that speed the observer could not get a good view of what was going on below him. When the Aero Club of America authorities answered that the speed would be one of the principal factors in military aeroplanes, because aeroplanes would be employed in fighting and for bomb dropping, so-called authorities asked, "What will you fight with, your fists?" The aero club authorities stated that machine guns and bombs would be used, and the technical obstructionists presented mathematical computations to show that the recoil of a gun and the dropping of a bomb weighing more than 50 pounds would upset the aeroplane. We know now that it does not, but that is what they said, and many people believed them.

Those who expressed the possibility of equipping aeroplanes with two or more motors were considered visionary, and again mathematical computations were presented to show (1) that a machine equipped with two motors would be unable to lift its own weight; (2) if one motor stopped the other would make the machine spin around and, presumably, disaster would follow.

Only a few months ago—early this year—when the Aero Club of America offered its assistance to Admiral Fiske in developing the torpedo plane and experiments were being planned a man who is now an officer in the Army air service in Washington wrote several earnest letters to Admiral Fiske, with arguments to prove that it was mechanically impossible to construct an aeroplane of the type proposed.

There are such notions now regarding the larger aeroplanes. Some people bring up petty theoretical notions in an attempt to prove that larger machines can not be built.

The only way to deal with individuals obsessed with such theoretical notions and prejudices is to tell them frankly that aeronautics has been held back by notions and theories and request that they promptly get in touch with all the available authorities on the subject and get their expressions of opinion and report as soon as possible. In most cases men of this type must be told that the human mind only works one way at one time and that if it works to try to prove that a thing is impossible it can not at the same time figure out ways to make it possible.

The only way the writer has found it possible to bring such men to reason and to cooperate in evolving problems has been found to tell them very frankly that what we are interested in at the present time is to win the war and not to prove or disprove any theory, and that every man's attitude should be one of wanting to shift to any position where he can contribute a greater part toward winning the war, instead of holding to a petty theory purely for the sake of not "giving in."

For instance, a rather prominent American aviator who had served in France called recently and stated that no time should be wasted on large machines, but every effort should be concentrated on turning out small fighting machines. He was very persistent on that point, but he realized his mistake when he was told that he was only looking at the matter from the standpoint of maintaining supremacy in the air on the different fronts, but was not dealing with the matter of weakening Germany by wrecking her lines of transportation, destroying her military and naval bases and putting the fear of God in the German heart by conducting bombing raids in the very heart of Germany.

(7) *Cost plus versus British, French, and Italian systems of fixed prices.*—We have received a great many complaints from people who work on the cost-plus basis and fewer from those who work on the fixed-price basis.

The main complaint against the cost-plus basis is that it is not conducive to greater production, but rather conducive to greater expenditure and greater cost. The manufacturers themselves complain of this condition, because they are interested in producing the maximum, but they can not get their foremen and workmen to take interest in greater production so long as there is not some kind of inducement. It is well to speak of patriotic inducement, but that usually wears out as soon as some situation appears in which the Government apparently is at fault in some point. Then labor feels that patriotism is all on one side, and the patriotic interest vanishes.

On the other hand, when there is an inducement such as the bonus inducement, the interest does not wane and die. It rather grows stronger, because the workmen and the workmen's wives and families take an interest in it.

The fixed-price plan used in England, France, and Italy is conducive to larger production, but it must be accompanied by financing the firms when they need it to carry out their orders, just as firms working on the cost-plus plan are financed, with, of course, the necessary adjustments.

(8) *Eliminating delays caused by changing of types of aeroplane to be manufactured.*—The most important delays in production caused by changing of types of machine can be eliminated by—

(a) Making sure that the machines selected to be manufactured is a tested, tried, and efficient type.

(b) That there are the complete working blue prints and specifications available.

(c) That the blue prints and specifications were corrected by the original manufacturer when mistakes were found in the manufacturing (this is to avoid mistakes that have occurred again and again, due to the fact that whenever the foremen in the factories found that the blue prints were wrong, they just corrected the mistakes in the factory without transmitting the corrections to the drafting department and getting the corrections made in all blue prints).

(d) That the jigs, tools, and patterns are ready in large enough number for manufacturing or that the firm that has been asked to manufacture the selected type of machine has the facilities for making the jigs, tools, and patterns, and is advised in advance, before it stops working on another type of machine of the change, so that it can prepare and provide the necessary jigs, tools, and patterns.

(e) When the working blue prints are imported from France or Italy notification should be sent to the manufacturers of the type of machine

selected for future manufacturing, so that they may prepare; and there should be provided a body of draftsmen and experts on the ship which is to transmit the working blue prints, so that the drawings can be translated from the metric to the foot system, and other necessary translations be made in specifications for American factories.

(9) *Other points to be considered in connection framing a policy to produce quantity production of aeroplanes and motors.*—The following points should be considered in connection with the policy to be adopted to produce quantity production of aeroplanes and motors:

(a) Reliance must be placed only on tested and tried types of aeroplanes and motors.

(b) It is necessary to give quick decisions and make no changes after decision has been reached until the plan has been carried out.

(c) There must be close relations between the manufacturers of the different countries and the military authorities of the different countries to avoid the mistake of having the military authorities using blue prints of old-type machines instead of the latest blue prints of the same type machine, as occurred recently, which caused considerable delay and waste of material that had already been used to make parts of a certain machine based on old blue prints.

(9) *Production must be separated from experimental work, so as not to have hopes created by experiments interfere with and delay the production of standardized aircraft and motors.*—Whenever a foreign type of aeroplane or motor is adopted every effort should be made to get experts from the factories making that type to supervise the manufacturing until experts can be trained in this country. Having gotten such experts they should be placed in a position to give the utmost assistance.

(10) *Preference should be given to large types of aeroplanes and motors which are not apt to grow inefficient while being manufactured.*—The entire theory of inspection should be reversed and inspectors should be made to report on the amount of material that they pass rather than putting a premium on the rejections. At the present time the entire theory of inspection of materials puts a premium on rejections instead of putting a premium on production.

OTHER AERIAL WEAPONS AND ARMAMENT TO BE PRODUCED IN THE UNITED STATES.

Different types of aeroplanes are equipped with a different number and size of aeroplane guns and bombs. In the appendix are given two articles written by the writer last summer explaining the armament of different types of aeroplanes at the time. Some improvements have been made since, such as the use of large guns of the 37-millimeter type on a small combat aeroplane of the Spad type.

Other aerial weapons and armament that can be produced in the United States includes the following:

(1) *The Fiske torpedo plane.*—The Fiske torpedo plane consists of the combination of a most efficient 6-inch torpedo which can be carried by land or water aeroplanes and launched against ships. Larger torpedoes can be carried by larger aeroplanes.

(2) *The John Hays Hammond system for coast defense and offensive against ships.*—The Hammond invention permits controlling by radio of a modified standard torpedo running submerged loaded with explosives from an aeroplane 8,000 to 9,000 feet up and 3 or 4 miles from the boat. Experiments have shown that the radio control is perfect and that moving targets can be struck by a torpedo controlled by the operator in the aeroplane. The experiments on this system have been completed, and this weapon is ready for adoption.

(3) *The Sperry aerial torpedo or "flying bomb."*—In 1915 the New York Tribune published a letter from its Paris correspondent explaining the Sperry wireless-controlled aeroplane, which can be loaded with explosives and launched without pilot, to be directed by wireless, to strike a target many miles away. This representative was the roommate of Mr. Lawrence B. Sperry, in Paris, and had learned this information there. The writer had an article written dealing with the subject completely, but found that Mr. Sperry, sr., did not wish to see anything further published, so we did not publish it.

The Sperry system is essentially an aeroplane automatically controlled and loaded with explosives, with detonating means. The full, automatic control permits its being sent in a predetermined altitude, and at a predetermined

distance to "nose dive" on the objective, blowing it up. The inventor stated in 1916 that it would be possible to build these aerial torpedoes to have from 100 to 1,000 miles range and carry from 200 pounds to 20,000 pounds of explosives. He believed that there are no limits to the size and range of these weapons.

STATUS OF THE AERONAUTIC SCIENCE AND ART AND WHAT WE MAY EXPECT IN DEVELOPMENTS IN THE COMING TWO YEARS.

Aeronautics is yet in its infancy, especially from a scientific standpoint, as a manufacturing proposition and as an applied art.

The fundamental scientific principles were established on deductions which, as Mr. Orville Wright told Messrs. Alan R. Hawley, Congressman Murray Hulbert, and the writer as late as August, 1917, are incorrect by between 200 and 300 per cent.

Until recently the aeronautic movement was a poor, struggling thing, and manufacturers could not afford to undertake lengthy, original research, and the Government made no provision for same. What was called research work was really commercial analysis of existing things, conducted in the established way. The men employed in the so-called "research" were overworked with tests to be made of materials and aeroplane parts and models. They did not have the time to give to original research. Original research may be expected to bring forth surprising developments. In the past eight years we have seen that the development of new wing curves has increased the lift of aerofoils (aeroplane wings) from 6 pounds per square foot to 11 pounds per square foot. In other words, whereas eight years ago we could only figure on lifting 6 pounds for every square foot of wing surface, we now figure on lifting almost double.

We have also found that two-thirds of the "lift" of the wing comes from suction on the top side of the plane instead of being entirely from air pressure on the under side of the plane. Lack of understanding of this caused the loss of many lives, due to collapse of machines that were not properly trussed to stand the suction from above.

Greater lift from wings is one of the results to be expected from research in that direction.

Larger aeroplanes must also be expected as a result of original research. Capt. Hugo D'Annunzio, who is in this country arranging for the manufacture of Caproni aeroplanes, told the writer that Mr. Caproni and himself consider the building of an efficient 5,000-horsepower air cruiser as entirely possible and practical.

A few months ago Mr. Hellahammer, the Danish inventor, who made a flight in a self-made aeroplane as early as 1906, called on the writer and showed the photograph of an aircraft—not a helicopter—capable of rising vertically from the ground and descending the same way. The principle seemed to solve the difficulties of the helicopter.

A few months ago Mr. Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, at a meeting with the writer and Mr. Glenn L. Martin, the aircraft manufacturer, was told of the difficulty of quick production of aeroplane wings constructed as they are at present. He set to work and evolved a machine and a compound of fiber and horsehair and other materials, which would permit stamping out aeroplane wings at the rate of a number per hour. This method, which seems to insure the desired strength of construction and lightness, would eliminate the tedious and costly handwork as well as the use of fabric for covering the wings and of aeroplane "dope" to tighten the fabric. He is hoping to be able to arrange for a test by the Aircraft Board. It should be done as soon as possible.

A great many attempts have been made in the construction of steel aeroplanes, but whenever the construction was light enough the result usually was the buckling of the wings and the crystallization of metal parts due to vibration.

Experiments are at present being conducted by the Aircraft Board in the construction of complete steel aeroplanes. Success would mean great saving in time and cost in manufacturing aeroplanes and elimination of danger from fire.

These are only some of the most evident possible developments in the line of aeroplane construction. Similar developments may be expected in most of the parts of aeroplanes and the instruments and armament used.

**ABSOLUTE NECESSITY OF CONDUCTING ORIGINAL RESEARCH AS DIFFERING FROM
MERELY MAKING SCIENTIFIC ANALYSIS OF EXISTING THINGS.**

It is absolutely necessary for the Government to foster original research in aeronautics, as differing from merely making scientific analysis of existing things.

It is the best investment that can be made at present.

The CHAIRMAN. Is there any other matter, Mr. Woodhouse, which you desire to refer to, and which you think would be helpful to the committee?

Mr. WOODHOUSE. A point not covered in the report is the continued increase in the number of aircraft in the present war and the necessity for making plans for 1919-20, and to consider that the proportion of the number of aircraft and the size of the armies at the front have been increasing from 500 per cent to 3,000 per cent. For instance, in 1914 France started in the war with 100 airplanes, because the others were needed for training, and most of them were not suitable for war purposes. They constructed 3,000 in 10 months from the beginning of the war to 10 months later.

The CHAIRMAN. That is France, and not England?

Mr. WOODHOUSE. France entirely. And the increase in the number of airplanes employed has been greater and greater each year thereafter. This is stated because it is a very important point in the consideration of the plans for aircraft. If it is not taken into consideration, we may find that a year from now, although we have built 20,000 airplanes, we are still unable to cope with the situation because we did not consider that the enemy will employ a great many more in connection with every branch of the fighting forces as time goes on. In other words, when the war started airplanes were used for close to six months only for scouting, and a very few were used by the French for directing artillery fire. In December of that year they began to drop bombs. A few bombs had been dropped before, here and there, but the actual bomb dropping began after the bombing of the Belgian cities by the Germans in 1914. Then there came into use, of course, thousands of airplanes for directing artillery fire. In that service the number of airplanes to be used is elastic, for this reason, that airplanes must be kept over each battery to direct each battery, no matter how many it may take to keep a given number of airplanes up over a certain sector. If something happens to an airplane, immediately another one takes its place. This was true, for instance, in trying to locate the large German gun which had been firing on Paris. Airplanes were sent out in every direction to look for that particular gun, which was very well hidden. They located approximately the place, but each time the gun was so thoroughly hidden that the German barrage fire and the German antiaircraft defenses and the German combat machines were always able to bring down the allied airplanes that were looking for that particular huge gun which was bombarding Paris. That is true of any German gun that fires. The allies immediately have to send airplanes to find out where it is, then they shell the particular place to destroy it. Airplanes are now used with every branch of the service, and the number used in connection with each branch of the service is increasing and becoming greater and greater. The best point, which is very important, is the matter of shipping airplanes. It takes about 50

ship-tons of space, meaning a flat car, to transport the average training machine. It takes from 200 to 250 ship-tons to transport a large bombing machine.

The CHAIRMAN. Is that true if they are disassembled and then reassembled across the sea?

Mr. WOODHOUSE. That depends to what extent they are disassembled. For instance, you could not disassemble a flying boat nor a float, a pontoon, nor a hydroaeroplane. Likewise it is very much more advisable to send the complete actual body or fuselage of an airplane as a body rather than as parts. This is also true of wings. It is better to send the wings packed up all finished to France; but any discussion of such a thing as that is all relative, for this reason: That we know that we have a limited amount of shipping and we know we have an unlimited demand for everything far exceeding the shipping space. The demand for every kind of war material is exceeding the amount of shipping space. Therefore in considering the shipping of aeronautical material we have to consider how much we can send by ships, how much tonnage are we allowed to carry aircraft within a year—aircraft, munitions, and supplies. Supposing that, in a knockdowned way, we can send 10,000 small planes with all the shipping available for aeroplanes. Supposing we have now shipped, according to Secretary Baker's report of June 7 to Mr. Dent, the chairman of the House Committee on Military Affairs. He states that up to that date, June 8, there had been made in this country 4,400 preliminary training airplanes, meaning the airplane used to give the preliminary training to aviators up to the point when they can fly, but not up to the point where they have had any practice in fighting or cross-country flying or any of the advanced training. That number of airplanes, allowing two airplanes per man in training an aviator, would mean enough airplanes to train 2,255. Then Secretary Baker states that the deliveries of advanced training planes to June 8 amounted to 820. That means keeping about 69 aviators at the front for one year. That would be about the figure, allowing 100 per cent replacements per month. This gives us an idea.

The CHAIRMAN. One hundred per cent replacements is not necessary for a training plane.

Mr. WOODHOUSE. No; these are advanced training planes. I mean if we used advanced training planes, because I think he meant by that the De Haviland fours and the Thomas scout. I take it for granted from the report by Secretary Baker that these are the only two types built in this country, and, as we know that the only advanced training planes built so far have been the Thomas-Morse, that does not include the Scout and the De Haviland, according to the official reports, so then it necessarily follows that these 820 machines were of these two types unless they included Curtiss machines with a high horsepower motor, such as the Hispano-Suiza or the Liberty.

The CHAIRMAN. We were shown what were called training planes in the process of manufacture by the Curtiss Co., which I think was the Curtiss advanced plane.

Mr. WOODHOUSE. Yes; with the Liberty or the Hispano-Suiza motors. In the program of shipping we have to ship enough air-

planes to keep 5,000 aviators flying for a year, and I will say that if we do not plan to keep 5,000 aviators flying at the front we will find that we are short in our fighting air forces. To try to send those machines and keep those 5,000 aviators at the front, whether bombing, or combat, or directing artillery fire, or scouting, or contact patrol, or cooperating with the infantry, we will find that we have not a fraction of the shipping necessary for sending those airplanes abroad, and for that reason those of us who do the detail work of preparing and planning have been thinking very hard of the trans-Atlantic flight, or flying the machines across the Atlantic under their own power, and of any way they can be sent over. We find, after thorough investigation, that an airplane flying throttled down beginning one hour after starting—the first hour the machine will be fully loaded and will need all the power, but an hour later it can begin to fly throttled down, will have a life of about 600 flying hours and the life of the motor will be about 500 hours. It will take about 50 hours of flying, including the tests, to fly the machine across the Atlantic, so it will leave 450 hours of flight in which to bomb Germany, which means to fly indefinitely, and it will be destroyed long before the life of the machine is exhausted.

Senator NEW. Destroyed by the enemy?

Mr. WOODHOUSE. Yes; or by landing or anything else. We have consulted with a great many authorities, and practically all the authorities are in favor of the plan, but nobody seems to dare to father the plan to fly the machines across the Atlantic. But, at the same time, not only are the authorities in favor of the plan, but aviators from every part of the world—meaning the French, the British, the Canadian, the Italians, the Belgians—all want to fly the machines across the Atlantic. American aviators in the Army and Navy keep on coming to the Aero Club and say, "Can I not get a chance to fly across the Atlantic?" The number of aviators who would like to fly across the Atlantic is enormous. The committee may be interested in figuring just how many you will have to send over, supposing that the plan is to keep 5,000 American aviators at the front for a year. There is no doubt whatever that the minimum that we can look forward to sending—the minimum number of aviators that we can keep at the front—is 5,000. That means 5,000 airplanes per month, even if the proportions have not increased. That means 60,000 machines in a year. At the present time they are using about 20 per cent single-motor machines. I mean, the plans are to go toward the twin-motor machine because it is safer. If one motor stops, the pilot comes back. So, about 20 per cent single-motored machines is all that you can figure on, and 30 per cent twin-motor machines used for various purposes, and then 50 per cent of three or more motors.

The CHAIRMAN. You do not refer to the two-motor machines at all?

Mr. WOODHOUSE. Yes; twin motors. This is true of the plan as it is carried out to-day, meaning by that that the tactics have changed in the past three months. The British since the advent of the air ministry have been concentrating on bombing. Their dispatches speak of bombing. Why? Because this is the only way to break up the enemy to prevent him from bombing and preparing a drive and transporting his troops and making munitions; so the proportion of

bombing planes has increased, and with the increased bombing there has come the realization that it avails very little to the allies to bomb Belgian soil, because the effect does not reach Germany. While, if they strike past the Rhine, the Germans begin to shout for protection and move to other cities. I remember reading recently a number of dispatches from the other side, published in the press, stating that in different cities, like Mannheim, the people were moving to Switzerland because they had been bombed so many times, and they demanded a change in the administration like when the Germans were bombing London, when the British people were always demanding a change in the air administration; and they do it mighty quickly, too. That is why they changed about three of the authorities having charge of aircraft, such as the Assistant Secretary of State for War in Parliament. They tried to explain how the Germans had come and how they were doing wonderful things, but the public pretty soon got so nervous over sleepless nights and so run down that it did not reason any more, but just said, "You have let the German aviators bomb us. We have had promises heretofore, and promises have not kept the Germans out of London." That, more than anything else, brought about the changes in the British administration which led to the air ministry. The air ministry adopted the policy of bombing. That policy is a success.

The change in the British policy has not been noted officially, although it has been in effect three months, and the proportion of larger machines has been increasing, and it is increasing faster and faster every day, and that is what we have to do with at the present time; that is, the necessity of considering that increase in bombing machines. We have dealt entirely with the small machines and not enough with the larger ones. In connection with this I restate that there is a tremendous relief now over the statement of Mr. John D. Ryan, the Chief of the Bureau of Aircraft Production, who stated on July 6, when he witnessed the launching of the first Handley-Page battle plane, that "This is one of the battle planes of which we are building thousands upon thousands."

The CHAIRMAN. No; he did not say that. I was there. He did not say it, because it is not true. You saw what all of us saw in the newspaper, and you have a perfect right to believe it.

Mr. WOODHOUSE. It was the general feeling, and it was the feeling of the Aero Club of America. There was a meeting immediately of the executive committee to consider it and to praise Mr. Ryan and the Bureau of Aircraft Production and Gen. Kenly upon their adopting a policy of building thousands upon thousands of machines. Of course, the Aero Club of America, dealing usually from the broadest standpoint of the subject, finds that to-day the aircraft organization, meaning the Department of Military Aeronautics, and the Bureau of Aircraft Production, have a remarkably strong and forceful organization in each case, and it seems to us, as we come into daily contact with these men, that the only main problem is that they have not yet gotten together to compare notes on what should be done immediately, not what should be done after a commission has been sent to Europe, or what should be done in 1917, but what should be done while carrying out the 1917 program to have a program ready for 1919, and to have a program large enough to provide to keep 5,000

aviators at the front supplying the monthly replacement of 40 per cent in aviators and 100 per cent in machines.

We also find that there are tremendous manufacturing facilities practically idle that could be utilized, and the Bureau of Aircraft Production very properly says that they are waiting to be told what additional program is required. The Department of Military Aeronautics, with Gen. Kenly at the head, have just begun, and I think—I have to say that I think rather than that I know—that Gen. Kenly's office is also waiting for an additional program which his office does not make, but which is planned elsewhere than in his department. So that we have a wonderful organization now with plenty of energetic men in the Department of Military Aeronautics and the Bureau of Aircraft Production, but I should say they are working about 40 per cent of their capacity, because they have not additional plans to go ahead with. In other words, they are still carrying out the 1917 program with a few minor additions where they should be carrying out the 1917 plus the 1918 and the 1919 programs.

We have talked with a great many of these men who are in both organizations, and in both cases we found they were very anxious to go ahead and were held back by an unseen something; that is, somebody to say go ahead with these preparations to send 5,000 aviators to the front and keeping them there, supplying 40 per cent per month in aviators and 100 per cent in aeroplanes for replacements. Decision to go ahead with such a plan is the one thing that is required more than anything else.

In other words, to understand the size of the job and carry it out. There is one more point, if I may be permitted to bring it to your attention, and it is perhaps the most important thing, next to the producing of the airplanes and the aviators, and that is to keep the aviators after you have them, meaning by that it is necessary to extend the wonderful work which is being done by the medical service at the present time under Col. Lyster. As Mr. Walter Camp, the noted authority on athletics, has pointed out, we ought to have a trainer with every aero squadron to look after the physical condition of the aviators, because aviators cost something like between three and six months or more to train, in which time they get about 100 hours of actual flying, and by the time they cross the lines with an airplane costing from \$25,000 to \$50,000, according to the size or armament or the equipment of the airplane, they represent an investment of pretty near from \$35,000 to \$50,000.

Now, our aviators have been suffering and their efficiency has been cut down and their losses have been caused by the fact that we put every thought on the airplane and little on the aviator. The piece of machinery that we spend money on we take care of. The airplane we take care of and also the gun and the motor. We say the motor must have castor oil or this or that, but when it comes to the aviator we will not give him two pairs of gloves if he tears one, and yet if he goes up with cold hands and the enemy comes at him with a speed of 125 miles an hour and he is going at that speed, he has to think and act at a speed of 250 miles an hour. That is very fast to have to think and act. Supposing we put the speed of the machine at 100 miles an hour to be conservative. He is flying at that speed and the enemy is flying at him or over him or with him at that speed. He

has to control the machine, to aim the gun and fire it, and all that at a speed of 200 or 250 miles an hour. Now, the fraction of a second means victory or death, because they do not take prisoners in the air nor wounded, and if the aviator has cold hands and cold feet, meaning physically, or if he does not get the proper food, or if there was not a trainer or an instructor ready to say, "Now, Mr. Smith, you can not go out this morning, you are not fit," he would fly and probably get killed, and cause a loss of about \$35,000 to the country.

If there is not a trainer there like in every football game to see that Mr. Smith does not go out if he is not in physical condition to fly, we lose an aviator and an airplane, a total investment of from \$35,000 to \$50,000, just because we did not have a trainer with a salary of \$2,500 a year, or because we did not supply the aviator with an extra pair of gloves, or because we did not supply four blankets instead of two when it was cold enough to have four.

The CHAIRMAN. Why do you say those things are not being done?

Mr. WOODHOUSE. I said that in the past the organization did not develop to the point—whose fault it was I can not say—to supply those things, and I say this with the facts back of me in this way: Last winter as soon as the cold set in we had applications from a number of aviation camps for blankets, sweaters, socks, gloves, and other necessities. They said the regulations allowed only two blankets and the dear Lord had sent us weather that required four blankets, but in this case we supplied the blankets. Frankly, we supplied a great many blankets.

The CHAIRMAN. You say that "you" supplied them. Do you mean you supplied them at the expense of the club?

Mr. WOODHOUSE. At the expense of the Aero Club of America, of the aviation committee of the National Special Aid Society, and of the New York branch of the Women's Naval Service, and similar organizations, which said, "It may be true that later on these boys, who are fighting for us, will be supplied; it may be also true that the regulations do not permit more than two blankets; but they are suffering, and we will supply what is needed now." Perhaps it may be well to quote a case without the names, if I may be permitted: At Omaha at the balloon training school they had received 300 or 400 men who lacked blankets and a great many other things, and they were very cold, and there was a colonel at the time visiting. He belonged to Gen. Squier's office. He saw the conditions, and when he came back to Washington he presumably tried very hard, we will take it for granted, to see if he could get any additional blankets and mattresses and socks, etc. At all events, he wrote to the commanding officer at Omaha and said that the best way out of it was for him to apply to the Aero Club of America, because he understood that the Club would supply such things quickly. Of course, it is not an order for you to do so, he wrote, but it is a suggestion. It was on official paper; and the man, I could almost see in his letter, was battling between two things—one, officially, he could not ask the commanding officer of that station to apply for those things, but humanely he knew that the men would suffer if they did not get those things.

We got the letter, and it asked, I think, for over 300 pairs of blankets and over 70 military mattresses and other equipment in proportion. We called up the aviation section of the National Special

Aid Society of New York, Mrs. William A. Bartlett, and within a few hours those things had been expressed to Omaha, and they were received there and were used. That was true of about, I should say, at least a dozen Army stations. It was also true of a great many naval stations.

Senator FRELINGHUYSEN. When was this?

Mr. WOODHOUSE. Beginning in November and on until the cold weather ended; and, furthermore, a great many, in fact hundreds, of aviators arrived in New York to be sent overseas. They had read in the magazines that such things were furnished. Each number of Flying carries a section giving the reports of the National Special Aid Society and the Women's Naval Service, and you will see right here a report—on pages 540 and 541 of the July number of Flying—a report giving the names of the officers who have received blankets and other equipment in the past months when going overseas.

The CHAIRMAN. Your last recommendation, in short, is that we ought to take better care of the flyer than of the machine, and excellent care of both.

Mr. WOODHOUSE. My recommendation would be that every man that goes overseas ought to be equipped before he goes overseas, and that recommendation is based on an incident which your committee will be interested in.

Senator FRELINGHUYSEN. You mentioned a certain letter written by an officer. Did you see that letter?

Mr. WOODHOUSE. I saw it and read it and acted upon it with the executive committee.

Senator FRELINGHUYSEN. Can you procure a copy of that letter for this committee?

Mr. WOODHOUSE. I can procure a copy of the letter for you.

The CHAIRMAN. You mention this as a typical incident.

Mr. WOODHOUSE. Yes, sir; it is.

Senator FRELINGHUYSEN. Also, you mention the further equipment of aviation officers who have been supplied with blankets, mattresses, and pen rolls and other equipment for over-seas service, and you show a list in the July, 1918, issue of Flying. These are officers in the United States service?

Mr. WOODHOUSE. In the United States Army Air Service.

Senator FRELINGHUYSEN. Who have been equipped with mattresses and blankets and other equipment from private funds?

Mr. WOODHOUSE. From private funds; yes, sir. They have been equipped with additional equipment, and a similar report can be found in each number of Flying, beginning with last November, giving the names of the officers and what they received.

The CHAIRMAN. Are there any other points that you wish to bring up?

Mr. WOODHOUSE. Yes; that the officers who arrived in New York about four months ago were so numerous that it would have been impossible for us to assume the responsibility of equipping them, so Mrs. William A. Bartlett, the chairman of the committee of the National Special Aid Society, wrote to Gen. Squier and to an officer in the Aircraft Board asking why these men were not equipped before being sent overseas, and the answer came back that they were. But the men came again, and they did not have the things, and a

letter went back to Gen. Squier's office saying that these men were not equipped, and then another letter was received, signed, I think, by Col. Arnold, stating that these men would receive their equipment on the other side, including some electrically heated clothing. Every man that came in was handed a copy of that letter, and Mrs. Bartlett said: "Boys, I would like very much to do something for you, but here is a letter saying that you will get these things on the other side." These boys arrived at the other side, and in due time letters came from them saying that "the electrically heated flying equipment is a myth. It is only a legend that has been going around, because we have never seen any. As for getting the equipment we need, it does not exist in any amount that will permit them to give it to us." We have some letters, including some cables, received from the other side to that effect.

Mr. WOODHOUSE. I would like to speak of another important matter. Every time the plan is proposed for a number of airplanes or for aviators or for the building up of our air forces an objection, purely technical, is brought forward, which says that to have 10,000 airplanes at the front means having an average of 47 men on the ground for each airplane. That point is brought forward as a reason why it is not possible to go ahead with the plan, because the ground personnel is required is so enormous. Now, I want to explain that the authorities themselves, the French, British, Canadian, and Italian authorities, have pointed out in the past few months that the ground personnel required to-day is only a fraction of that number, because the machines are flown to the front and because the machines are flown from one point to the other, and we no longer at this day require such an enormous amount of organization at different places to carry the squadrons from one place to the other on trucks and pack them and unpack them. Therefore the proportion given of 47 to 1, meaning 47 men on the ground for 1 aviator in the air, are no longer true.

The CHAIRMAN. What is the proportion?

Mr. WOODHOUSE. I think it would be better to find it out by inquiring officially. It is much less. It is only a fraction of that number, and I believe it will be found that we have provided all the ground personnel required to handle an organization many times as large as that planned.

The CHAIRMAN. Mr. Woodhouse, the committee wants to express its appreciation of your coming to Washington and giving us the benefit of your information and experience; and if you like, we will have a copy of this testimony sent to you for correction.

Mr. WOODHOUSE. If I may, I should like to add that we have heard high commendation of Gen. Kenly's plan to place officers who are experienced aviators in charge of the aviation schools. This general approval comes from military aviators and observers and from their parents. It gives greater confidence to the cadet and the student to know that the orders and rules which he obeys have been made by officers who are themselves aviators.

(At the suggestion of Mr. Woodhouse letters of inquiry were sent out relative to letters received from aviators on the front who were practically idle, due to the lack of aeroplanes and letters from commanding officers and individuals at air stations, either in the United

States or overseas, asking for additional supplies such as clothing, bedding, etc. The following replies have been received:)

WAR DEPARTMENT COMMISSION ON TRAINING CAMP ACTIVITIES,
Washington, D. C., July 12, 1918.

Mr. S. W. McINTOSH,
Assistant Clerk, Committee on Military Affairs,
United States Senate, Washington, D. C..

DEAR SIR: In answer to your letter July 11, I would say that the only appeals that we have had from officers in charge of air training stations near New York were handed to us in December or possibly early in January by the Aero Club of America, and those appeals are on file in the Aero Club and not in this office.

This committee confines its attention entirely to equipping over-seas squadrons and military air training stations in this country with full athletic outfits, musical instruments, victrolas, records, etc., and our aim is to continue to keep in mind the efficiency of those forces rather than of individual aviators. We do not, at the present time, equip any individual aviator with anything whatsoever. Would like to add, however, entirely as a personal matter, that I have found in my work among many aviation officers, that the requirements of their flying equipments seem to fall very heavily on those who are not provided with means, and that, as I understand it, the Royal Flying Corps equip all students with a full flying equipment as soon as they leave the training field and become officers in the aviation section, and I further understand they also hand them quite a large sum to help them through the first stages. It has always seemed that something of that sort could have been done by our Government.

We would like to add that this committee sent forward to date to the concentration camp at Garden City 127 athletic equipments for over-seas squadrons, and at same time has given a full athletic equipment to 18 of our large air-training fields.

With many thanks for your letter, and regretting that I can not help you more at this time,

I am, very sincerely, yours,

CAROLINE VAN RENSSELAER,
Chairman.

AVIATION COMMITTEE OF THE NATIONAL SPECIAL AID SOCIETY (INC.),
New York, July 15, 1918.

CHARLES S. THOMAS,
Chairman Subcommittee on Aviation, Committee on Military Affairs,
Washington, D. C.

MY DEAR MR. THOMAS: Thanking you for your letter of July 11, from Senator Chamberlain's office, may we call your attention to our letter written him on April 12, answered the 15th (copy inclosed), on the subject of equipment. Since September, when we organized the treasure and trinket fund, to supplement what the Government is doing for our aviators, we have been in constant touch with more than 700 aviators. The United States is spending millions developing the perfection of a flying machine—we are arriving at results we are sure to be proud of—but the matter of equipment is still of grave concern, since if perfectly equipped the aviator works synchronously with his machine and becomes a far more effective factor. May I quote Lieut. McF., who said to me yesterday, "The worst obstacle an aviator meets in equipping himself is that he does not know what he positively must or must not purchase." Could it not be possible to inform cadets from the beginning their best course in the matter of equipment, and if, for example, there are safe standard goggles, state where they may be bought at reasonable prices. Might we not have at each camp such a notice as the following: "The United States approves of said helmet, said goggles, said flying garment or garments, said boots, to be had at—"

Could not the commanding officers be held responsible for the well-being of their men in the air as well as out, and on issue, command what is needed for efficient carrying out of flying orders, dealing with them if they overreach or underreach for these needs later?

Our committee, concentrating our efforts on the officer, since so many of the cadets do not come through, has carefully considered his case. To become a flying cadet he left perhaps a lucrative occupation to serve in the air and has

no outside funds. On pay of \$33 per month as a cadet and \$75 as a flying cadet, there is small margin to save for purchasing equipment. He receives his commission and overseas orders often simultaneously, and he is confronted with the officer's list of requirements, appalling enough to a man with funds, but financially impossible for him—added to that list is his anxiety about his flying equipment.

In January, to aid them and us to a better comprehension of this matter, the following correspondence took place, embodying the reason for our conclusion, that since the War Department has designated its intention to give the officer his flying equipment on reaching his destination overseas, where he reports for service, we will not give any flying equipment and waited to hear from officers in France as to how this ruling was working:

FEBRUARY 8, 1918.

Col. H. H. ARNOLD,
Office Chief Signal Officer,
War Department, Air Division, Washington, D. C.

DEAR COL. ARNOLD: Your letter of February 4 in answer to mine referred to you by Howard E. Coffin states that the War Department supplies aviators with their entire equipment of flying equipment on receiving their commission, and further that the proposal by me to have \$250 given each aviator for initial equipment on receiving this commission for this reason is not believed necessary and would require special legislation. Where and how may these most desired outfits be obtained? It is a wonderful piece of news to us here, who for months have been seeing hundreds of men about to go over who have never received anything and for whom we have been able to spend since September \$30,000 in most necessary articles of equipment. There must be a hitch somewhere in the working out of this ruling. We raise money through the treasure and trinket fund, but can not possibly raise enough to meet these needs—very just needs—of the Air Service. Can this ruling not be made to work so that it reaches these hundreds of men? The morale is so splendid of these young officers—their reluctance to impose upon us in any way so obvious, their anxiety so genuine that if it is humanly possible we must, with your aid, make good this ruling.

Awaiting, my dear Col. Arnold, your consideration and assistance, I am,
Yours, very sincerely,

Mrs. WILLIAM ALLEN BARTLETT,
Chairman Aviation Committee.

And the reply:

FEBRUARY 19, 1918.

O. C. S. O., Supply Division, Washington, D. C.
To Aviation Committee of the National Special Aid Society (Inc.), 259 Fifth Avenue, New York City, N. Y.

1. From your letter it would seem that a general misunderstanding exists as to equipment which is being furnished the aviators both for overseas duty and at home.

2. Aviators' clothing is being shipped in bulk to be issued to aviators upon arrival at their overseas destination and need not be procured prior to embarkation.

3. Equipment for cadets at flying fields is being supplied in sufficient quantities to care for the needs of these students.

4. There was some delay in getting production on equipment for flying students in this country due to a change in the department under whom the purchases were to be made. Your list was taken from the list that was to be purchased by the quartermaster departments. This clothing is now being purchased by the Signal Corps in accordance with a new list of equipment for flying students.

By the authority of the Chief Signal Officer:

C. D. EDGAR,
Colonel, Signal Corps.

In the interim we helped them with their bedding rolls, trench coats, etc., until letters arriving at that time brought us to write Mr. William C. Potter the following:

APRIL 27, 1918.

WILLIAM C. POTTER, Esq.,

Equipment Division Signal Corps, Washington, D. C.

DEAR MR. POTTER: Realizing the great amount of important work you are confronted with, I hesitate to burden you with even a short letter, but our overseas mail brings information demanding attention. Many letters from first and second lieutenants, personally known to us since we have been privileged to be of some assistance to them, write of the lack of flying equipment, notably the absence of goggles, flying helmets, and gloves. To quote from one letter, "Equipment of this kind has long ago passed its period of usefulness, and it seems that they are receiving no new stock." Undoubtedly it is due to the changes in the air service board that these discrepancies exist. I have written all these young lieutenants quoting from the accompanying order, paragraph 2, feeling sure these supplies will be shortly forthcoming. Any advices from you on this subject will be greatly valued by us.

Thanking you for your consideration,

Sincerely, yours,

MRS. WILLIAM ALLEN BARTLETT,

Chairman Aviation Committee.

His advisement in answer was to the effect that a large order of flying equipment would be produced and consigned by August 1, 1918, to France.

When on the sudden and unexpected arrival of the German submarines, with the danger to our coast and our shipping demanded the immediate organization of a unit to aid in guarding our shores, our homes, our very lives, Army aviators with Army planes were called to help guard New York and its vicinity. Since this was veritable war-defense work, and the suddenness of this necessity made their position difficult, for flying equipment sufficient was not available for them, they came to us, and we were able to supplement what the Government is doing for these men. We gave them life belts, for although they are Army fliers, they do not find German submarines on land and must fly over the sea in their Army planes, if they are to be of any service. Flying helmets, goggles, coats, were in many cases lacking and they were provided by our fund. We concluded in this case to provide the flying equipment. I can refer you to Maj. Rhinehart for corroboration of these facts.

We have many letters from England, from France and Italy, and are merely sending you a sample of each—and the last received two days ago are particularly interesting.

We have grown to know the aviator is a highly specialized individual since he becomes in a most intimate way a part of the machine he operates. For this reason is it not true that the detail and perfection of his equipment is of vast importance, second only to his machine? Must he not have a helmet that fits him and suits him, goggles to be depended upon, gloves that warm his hands, without contracting their activity? Must he not be one with his extraordinary instrument, and not laboring under the handicap of misfitting helmet, goggles that do not remain in place, gloves too small or too large?

Appreciating vastly the opportunity you have given us to write you and any advice you may be able to give us,

Yours, very sincerely,

ALICE HUNT BARTLETT,

Chairman Aviation Committee.

P. S.—A full account of this work is recorded in each number of Flying. These letters you will understand were written to us in confidence. May we ask that the writers are guarded against any regret that they have written so frankly to us?

APRIL 12, 1918.

HON. GEORGE E. CHAMBERLAIN,

Washington, D. C.

MY DEAR SENATOR CHAMBERLAIN: The aviation committee of the National Special Aid Society has been supplementing the Government in providing equipment for our aviators, but on February 19, 1918, Maj. Gen. Squier sent us the inclosed ruling, which satisfied us that the aviators were to be supplied with flying equipment when they reached their overseas destination. Since receiving that letter we have given no equipment. That is now eight weeks ago. The accompanying appeal has reached us, together with several others of like nature, from the other side. If it is true that this flying equipment is not to be had, we would like at once to fill this man's request.

We give you this information, hoping that you will see fit to use it. Your work for the country has been so wonderful and sincere, and we are so thoroughly in sympathy with it that we are appealing to the three men who are standing in the breach between the alarming incompetency of the air board and the country. Can't we get a sufficient amount of this equipment at once sent across, or can't we see it is given these men before they go across?

Yours, very sincerely,

MRS. WILLIAM ALLEN BARTLETT,
Chairman Aviation Committee.

IN FRANCE, April 1, 1918.

MY DEAR MRS. BARTLETT: No doubt you are being worried to death by letters from "your boys," some in form of appreciation of the great work being done by the society and others in form of suggestions and complaints. Sorry to say this will have to partially assume the latter form.

While in your office on February 21 you handed me a letter from the Chief Signal Officer, Washington, D. C., requesting that you discontinue the issuing of flying equipment for aviators. He further stated that all necessary equipment would be issued over here. I beg to remind you that having been here a month now I have failed to find that huge amount of equipment mentioned in said letter. In fact, my entire squadron have not been issued as much as a pair of goggles as yet. * * * I guess that's enough kicks and complaints. Yes; we are all having a great time trying to parlez vous with these little French dames. Many funny and interesting incidents occur due to misunderstandings on both sides.

In closing, I wish you and the entire society the greatest of success in the future.

Very sincerely, yours,

LIEUT. C. D. SEWARD,
One hundred and thirty-ninth Aero Squadron, A. E. F.

THIRD AVIATION INSTRUCTION CENTER,
U. S. ARMY P. O. 724, FRANCE,
March 17, 1918.

DEAR MRS. BARTLETT: You who are providing comfortable flying equipment are actually saving the lives of the United States air pilots. Flying at the altitudes we must stay in at the front, we will quickly freeze our hands, feet, and faces if we are not properly clothed. When a man is numb from the cold he is apt to be killed in doing the stunts required, and he is mighty easy meat for any of the splendidly equipped Boches he might meet. England recognized the need for warm, comfortable flying clothes by giving each pilot a sum of several hundred dollars, and assists them in purchasing it at cost prices. While in the States we were told that we would be fully equipped, but such is not the case; we are even deprived of the bonus flying officers were formerly given. In our training here we are supposed to be furnished flying clothes, but they have enough for only a small percentage of us, so we who have none use newspapers under our sweaters to stop the wind. I expect to finish my flying training in May or early June. I graduated from ground school at Champaign, Ill., and was shipped here at once. I am married and have a wonderful little wife and baby to support, so you can probably appreciate my predicament. If we had not been told that equipment would be furnished, we would have managed to purchase it before leaving, because prices are much more reasonable there and we could have more easily negotiated for the necessary money. I have ordered my officer's uniforms, but have no flying equipment. If your society can do this shopping for me and will advance the money for it, I will be everlastingly grateful and hope my work will prove me worthy of your help.

Yours, truly,

J. M. MCKAY.

(O. K. J. G. DONOHUE.)

U. S. A. P. O., 724, A. E. F.,
March 22, 1918.

DEAR MRS. BARTLETT: One of the many ones who promised to write you a line concerning conditions—we have arrived here, the largest aviation field in the world, hundreds of miles of flying fields and hangars everywhere. I spent just

one week too long in the English rest camps—they were enough for me—I wouldn't care to go to one of the work camps. Now comes the important question, could I possibly get a coat and a pair of breeches, helmet sized 7, and goggles? As you know I came into your office just before we sailed one night and you could do nothing for us. You gave me a copy of what the Government had sent you. It's all a farce. The United States hasn't a single flying coat to even send over here. But we would go up without anything for a chance to fly. It's practically impossible to get any equipment at all, so that note the Government sent you is all O. K. if they have the stuff but they haven't got it over here where we need it the worst. Hoping to hear from you soon with best wishes to the Trinket Club of America, I am

Yours for the best of service,

DUDLEY ROBBINS,
First Lieutenant, R. M. A., A. S. S. C. U. S. A.

[April 29, 1918.]

SOMEWHERE IN FRANCE,
April 1, 1918.

DEAR MRS. BARTLETT: I promised you last January that I would write when I got to France, but I have kept putting off my letter in hope something interesting like mixing with a German or being in an air raid might happen to me but my life continues uneventful and I have no hair-raising tales to tell
* * *

There are three squadrons of aviators at the camp where I am writing from to-day who were in New York then, and the only ones of us all who having flying equipment are those whom you supplied. Besides, I am told that although this is quite a large and important camp there is no equipment here at all to be issued us. I can't understand why the authorities at Washington would misrepresent the situation to you as they did. Anyway you can see that your work is not in vain and I can assure you it is appreciated by us all.

Very sincerely,

LIEUT. G. A. McELVAIN.

BEMBRIDGE SAILING CLUB,
Isle of Wight, England, April 6, 1917.

DEAR MRS. BARTLETT: I take these few moments to thank you and your kind friends for the splendid flying outfit which you presented to me upon my embarkation from New York to foreign soil. Words can not express my appreciation, for without flying clothes I would have been at the mercy of the winds.

Not only do I send you my thanks and appreciation but also the gratitude of two other American officers at my station and many members of the royal flying corps, who have worn them more time than I. If you remember I embarked for France, but urgent service in England has kept me here. At present I am working every moment.

You know it alleviates the burdens of war to know that some kind folks appreciate your efforts and try every possible way to make flying more consoling. May your kindness be never forgotten and your life years of happiness for God never forgets, and flyers will always remember the lady who has comforted many and saved the life of one of my chums. Let me say that were it not for your leather flying suit, a boy whose place I am now filling, would not now be recuperating in an English hospital. He was lost at sea, and remained 80 hours clinging to the float of his machine, but, thanks to his warm clothing, he will not lose his legs, as expected.

Gratefully, yours,

ENSIGN CHAS. L. OSTRIDGE,
*U. S. Naval Air Force,
30 Grosvenor Gardens, London, England.*

SECOND AVIATION INSTRUCTION CENTER,
A. P. O. 717, France, July 19, 1918.

NATIONAL SPECIAL AID SOCIETY,
259 Fifth Avenue, New York.

AVIATION COMMITTEE: I have been in France since the 3d of last December and at no time have been able to obtain proper flying equipment. I am flying

every day at present and I am in need of one pair of aviators' goggles, one tan leather coat, and one leather helmet.

I have just read in the February issue of Flying of the excellent work you are doing in equipping men whom the Government has been unable to furnish the proper equipment—hence my S. O. S. or distress signal.

Trusting that I am not asking too great a favor of you,

Sincerely, yours,

CORLISS C. MOSELEY,
First Lieutenant, A. S. S. R. C.,
Second Aviation Instruction Center,
A. P. O. 717, France, A. E. F.

THIRD AVIATION INSTRUCTION CENTER,
U. S. AIR SERVICE, A. E. F., FRANCE,
March 14, 1918.

Mrs. WM. A. BARTLETT,
Chairman Aviation Committee,
National Special Aid Society,
259 Fifth Avenue, New York.

DEAR MADAM: In reading the February issue of Flying we have noticed with great interest your treasure and trinket fund and wish to congratulate you upon the work you are doing among the aviators back home. We, too, are experiencing great difficulty in procuring flying equipment, and when procurable it is necessary to pay double the prices paid at home for the same articles and good goggles are unprocureable at any price. We certainly would appreciate it if our needs would be met by your fund.

Very sincerely, yours,

FLYING CADET LESTER S. HARTER,
U. S. Air Service,
A. E. F., France.

A. E. F., April 9, 1918.

NATIONAL SPECIAL AID SOCIETY.
(Attention Mrs. Bartlett.)

DEAR FRIEND: After about a month's travel with several stops, I have finally arrived at my destination. We are now at one of the large American schools and are situated very nicely and are getting along fine. Your bed rolls and blankets are greatly appreciated, for we have had some real cold weather, and the boys who are without a bed roll feel it. The question of flying equipment has not been settled as yet. There seems to be some shortage as they are only able to supply some of the men while at the training schools. I believe the men on the front are being supplied with flying equipment, but many of the men here have had to buy their own equipment. I am more fortunate, however, as I had a very heavy fur coat, but did not bring a helmet or goggles with me, and was wondering if it would be possible for you to arrange to send me the same. Any effort on your part shall be greatly appreciated, and again thanking you for your kindness of the past, I am

Sincerely, yours,

LIEUT. R. J. LITTLE,
A. S. S. C. U. S. R., A. E. F., France.
Third Aviation Instruction Center. P. O. 724.

SOUTHERN FRANCE, A. P. O. No. 723.
April 12, 1918.

Mrs. WM. ALLEN BARTLETT,
Chairman Aviation Committee, National Special Aid Society,
259 Fifth Avenue, New York, N. Y.

MY DEAR MRS. BARTLETT: To-day I received your letter of the 15th of February and have posted it, for the information of the cadets, on the detachment board. We are awaiting with the greatest of expectation the arrival of the woolen garments, which you state are being sent. Many thanks for your aid. More strength to your prosecution of a most appropriate and worthy work.

We are now stationed at an observation and bombing school and will soon be sent to the front. There are many things which we actually need, but can not

obtain for love nor money. I would suggest to your society to open a cooperative store or something like that in one of the large French cities, where Uncle Sam's fighting men could obtain honest-to-goodness articles made in the United States. Everyday's life over here convinces us in some way of the superiority of our country in one way or another over that of our allies in arms, and I would suggest, further, that if it is decided to establish a "base" on this side, that it be stocked with such articles as blanket rolls, blanket, foot gear of all kinds, and coats of all styles, all a la Amerique. With the warmest best wishes for the continued success of your society, I am

Sincerely, yours,

S. K. STRUBLE.

SCOTT FIELD,
Belleville, Ill., July 4, 1918.

Mrs. WILLIAM ALLEN BARTLETT,
New York City, N. Y.

MY DEAR MRS. BARTLETT: From time to time while in ground school, in fact every month, I have read with interest the section of Flying devoted to your noble work. Since leaving the school and coming here I have need myself for your kind assistance. As you are no doubt aware, our allowance while I was at ground school was decreased from \$100 per month to \$33. This struck some of the boys very hard, myself included, inasmuch as we were counting our pennies, so to speak, and figuring on what we could purchase. As I have no means of financial support other than what I receive from the Government I am appealing to you for aid. * * *

Trusting I may hear from you soon, and thanking you in advance for any favors, I am, believe me,

Most sincerely,

E. EARLE GIBBONEY,
Cadet Squadron.

KELLY FIELD No. A,
San Antonio, Tex., March 1, 1918.

DEAR MRS. BARTLETT: Was with much pleasure and gratification I read the announcement in the magazine Flying of the great good and beneficial work the patriotic ladies of the National Special Aid Society have been doing, especially its work amongst the aviators. Would appreciate any information you are in a position to give me, as there are many chaps now doing their bit for Uncle Sam at the address on the letterhead of this paper. I am from New York and it sure does feel fine to know that the ladies from your home town think of you. Uncle Sam is doing his best to supply us with the necessary equipment but many of us are still without the necessary equipment. You no doubt appreciate its importance so that we may do our work as efficiently as possible and finally beat our common enemy, militarism. Again thanking you, I remain,

Sincerely,

EDWARD P. RODENHURST,
Cadet, Flying Squadron.

FLYING CADET SQUADRON, KELLY FIELD, No. 2,
San Antonio, Tex., February 17, 1918.

NATIONAL SPECIAL AID SOCIETY,
259 Fifth Avenue, New York.

DEAR SIRS: Before entering the Aviation Service I was a student working my way through college. I have almost finished the course and find it impossible to secure the necessary equipment from my salary, having no independent means.

In a few weeks I will be ready to take my place among the eyes of the Army, and in order to be efficient I must secure an extensive equipment, the cost of which my salary will by no means cover. Having heard of the work of your society I wondered if you had a fund to give temporary aid to the many young birdmen in the same predicament as I am in. Thanking you in advance for the information, I beg to remain,

Yours, very sincerely,

CADET CLYDE H. BUTLER.

EIGHTH AVIATION INSTRUCTION CENTER,
 AMERICAN EXPEDITIONARY FORCE,
Foggia, Italy, March 25, 1917.

NATIONAL SPECIAL AID SOCIETY,
 259 Fifth Avenue, New York, N. Y.

GENTLEMEN: In the February issue of Flying I was much interested in the service that the National Special Aid Society has rendered to aviators in the United States who had not been supplied with proper equipment by the air service. It is very hard for us to obtain American goods without a great deal of expense, which our pay as student officers is almost insufficient to cover. You would be rendering me a great service if I could obtain a leather flying coat and a pair of aviator's goggles. Over here we have two or three leather coats for 10 or 12 men on a line, which is very inconvenient and at times hinders our work. Aviator gloves are a necessity for high-altitude work, and the American glove is the only one that will keep out the cold. The two articles for which I ask your help can not be purchased over here, and among the men are in very great demand. I trust you can find your way clear to supply me with same. I am,

Very truly, yours,

CADET E. WHITEHEAD,
United States Air Service.

BELMONT PARK FIELD, N. Y., *July 15, 1918.*

Mrs. ALICE HUNT BARTLETT,
 259 Fifth Avenue, New York.

DEAR MADAM: Having heard of your generous assistance to those connected with the Aviation Service, I venture to ask if you can see your way clear to let me have a trench coat and a bedding roll. I am in charge of the aeroplane mail service at Belmont Park Field. As you know, our work in the open fields is very exposed during inclement weather. Also there are very poor sleeping accommodations, as there are only temporary quarters on the field. If you can grant my request I shall be pleased to dispatch to you one of the privates, with motorcycle, thereby saving you the trouble of transportation. I shall be glad to have you visit the station and can promise you interesting trip if you will call me on phone, Hollis 6751.

Respectfully, yours,

H. L. HARTUNG.

(Whereupon, at 1.30 o'clock p. m., the subcommittee adjourned until 10.30 o'clock a. m., July 12, 1918.)

AIRCRAFT PRODUCTION

HEARINGS

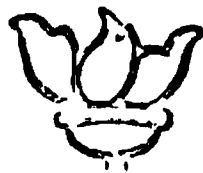
BEFORE THE

SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS UNITED STATES SENATE

SIXTY-FIFTH CONGRESS

SECOND SESSION

VOL. II



WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

COMMITTEE ON MILITARY AFFAIRS.

GEORGE E. CHAMBERLAIN, of Oregon, *Chairman*.

GILBERT M. HITCHCOCK , of Nebraska.	FRANCIS E. WARREN , of Wyoming.
DUNCAN U. FLETCHER , of Florida.	JOHN W. WEEKS , of Massachusetts.
HENRY L. MYERS , of Montana.	JAMES W. WADSWORTH, Jr. , of New York.
CHARLES S. THOMAS , of Colorado.	HOWARD SUTHERLAND , of West Virginia.
MORRIS SHEPPARD , of Texas.	HARRY S. NEW , of Indiana.
J. C. W. BECKHAM , of Kentucky.	JOSEPH S. FRELINGHUYSEN , of New Jersey.
WILLIAM F. KIRBY , of Arkansas.	HIRAM W. JOHNSON , of California.
JAMES A. REED , of Missouri.	PHILANDER C. KNOX , of Pennsylvania.
KENNETH D. McKELLAR , of Tennessee.	
HOKE SMITH , of Georgia.	

CARALYN B. SHELTON, *Clerk*.

SHELDON S. JONES, *Assistant Clerk*.

S. W. McINTOSH, *Assistant Clerk*.

SUBCOMMITTEE.

CHARLES S. THOMAS, *Chairman*.

JAMES A. REED.
HOKE SMITH.

HARRY S. NEW.
JOSEPH S. FRELINGHUYSEN.

CONTENTS.

	Page.
Airplanes on western front, memorandum concerning number of, by Col. V. E. Clark.....	799
Arnold, Col. H. H., Assistant Director of Military Aeronautics. statement of.....	741
Avram, Mois H., industrial-production engineer, New York City, statement of.....	899
Baker, Hon. Newton D., Secretary of War, statement of.....	1129
Bane, Lieut. Col. T. H., Signal Corps, statement of.....	841
Bristol history, notes on, by Mr. J. G. Perrin.....	791
Bristol planes, cancellation of contracts in connection with.....	1081
Brett, Maj. G. H., statement of.....	1191
Cablegram of Gen. Pershing regarding De Haviland 4 planes.....	1024
Cablegrams which led to the cancellation of the Spad contract with the Curtiss Co.....	772
Causes of delay in production submitted by Bureau of Aircraft Production.....	951
Clark, Col. V. E., technical section, Office of the Director of Military Aeronautics, statement of.....	773
De Billy, Edouard, acting French high commissioner, statement of.....	730
Footé, Lieut. John M., A. S. S. O. R. C., statement of.....	1034
Hill, Thomas A., statement of.....	710
Hunsaker, Naval Constructor J. C., statement of.....	997-1067
Irwin, Capt. N. E., Director of Naval Aviation, statement of.....	1076
Johnson, Capt. Charles C., statement of.....	1053
Jones, Maj. B. Q., Signal Corps, statement of.....	856
Jordan, John A., Liberty Iron Works, Sacramento, Cal., statement of.....	717-815-967
Kelley, Capt. J. H., Signal Corps Reserve, statement of.....	1046
Kenly, Maj. Gen. William L., statement of.....	927
Klein, Sergt. Alexander, M. S. E., Eight hundred and seventh Aero Squadron, McCook field, Dayton, Ohio, statement of.....	881
Lang, A. A. D., Lang Propeller Co., Jamaica, Long Island, statement of...	827
McCaughy, Walter E., report by, on defective parts found on De Haviland aeroplanes.....	1079
Martin, Maj. Harold S., Department of Military Aeronautics, statement of.....	867-1058
Marquisan, Lieut. Henri, of the French High Commission, statement of...	734
Motion of Senator Reed to print testimony taken by subcommittee.....	1127
Muhlenberg, Maj. H. C. K., statement of.....	1005
Nash, C. W., Aircraft Production Board, statement of.....	1107
Potter, William C, Assistant Director of the Bureau of Aircraft Production, statement of.....	1083
Reinhart, Maj. C. K., Aviation Section, Signal Corps, statement of.....	1039
Report on United States School of Military Aeronautics at Princeton University by John Grier Hibben.....	1141
Report of Senator Frelinghuysen on the Aero-Marine Plane & Motor Co. (Inc.), Keyport, N. J.....	951
Rice, Maj. Cushman A., statement of.....	709
Ryan, John D., Director of the Bureau of Aircraft Production, statement of.....	1143
Sayle, Walter D., Engle Aircraft Co., Cleveland, Ohio, statement of.....	974
Schroeder, Capt. R. W., Aviation Section, Signal Corps, statement of.....	1030
Scott, Capt. Riley, Office of the Director of Military Aeronautics, statement of.....	985
Smith, Maj. Frank E., statement of.....	874
Tait, Glenn M., Thomas-Morse Aircraft Corporation, Ithaca, N. Y., statement of.....	808
Tulasne, Col., of the French High Commission, statement of.....	732
Wells, Lieut. Frank W., Aviation Section Signal Reserve Corps, statement of.....	1059
Wittemann, Paul W., treasurer Wittemann-Lewis Aircraft Corporation, statement of.....	906

AIRCRAFT PRODUCTION.

FRIDAY, JULY 12, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 10.30 o'clock a. m., in the committee room, Capitol, Senator Charles S. Thomas (chairman) presiding.

STATEMENT OF MAJ. CUSHMAN A. RICE—Continued.

The CHAIRMAN. Maj. Rice, since you were here last, have you prepared any tables or any data with regard to the proportions and the relative merits of planes and of motors at the front?

Maj. RICE. Yes, sir; Senator Reed asked me to make up an approximate table of some sort that, without being absolutely technical, would show more or less the number of planes that have been operated and used successfully and satisfactorily by the British during the four years of war, and that are being so operated and used at the present time, the idea being to give the committee a chance to judge which machines are the most satisfactory and have given the best results. Naturally, the British, with their experience during these four years, would adopt the machines that have given them the best results, and that balances their service to give the best results.

Now, I have based this computation that I made on approximately 70 squadrons, or a matter of about 1,400 planes. This in no way represents the British strength. It is quite true that you might change the figures considerably by going through the whole British service, but it gives an approximate idea of which machines they are most generally using.

The Sopwith Camels lead with quite a proportion. Then there are the R. E.'s. That is an experimental machine which is a very fast flying machine, somewhat on the same principle as the Camel. Then there is the S. E. 5, which is also a fast-fighting single-seater scout machine.

Then come the D. H. 4's and then there is the F. E. 2. The F. E. 2 is a pusher type. It is an odd-looking machine. It has a metal frame. It is used a great deal for night bombing. It is not as fast as the others, but it is successful for that purpose. Then there is the D. H. 9, which is used considerably. There is the Bristol fighter. The Bristol fighter, in my opinion, is one of the most satisfactory and finest fighting machines they have over there. That is a two-seater fighter as against the single. Again, the British have used

and met with considerable success in the operation of the Handley-Page for bombing purposes; they use also the A. W. B. There is the Sopwith Dolphin, a very fast new machine with a high ceiling. They have installed a few of those. A few squadrons have those, but the proportion of Camels, R. E.'s, and S. E. 5's is much higher than the other machines. Of course, they are fast single-seater fighters. The D. H. 4's predominate in photographic and reconnaissance work.

I may say, Senator, that this table is not absolutely correct to a machine, or anything of that sort, but it just gives a general idea of what machines the British Government found could be successfully used and operated, and they are used and operated at the present time on the fighting front.

The CHAIRMAN. What can you tell the committee, if anything, about the training machine called the Avroe?

Maj. RICE. It is a very good machine. The British use it successfully for training purposes.

The CHAIRMAN. Do they use it exclusively for training purposes?

Maj. RICE. I doubt if they use any one training machine exclusively, though they may. They use the Avroe with good success. They are good machines.

The CHAIRMAN. What engine does the Avroe use?

Maj. RICE. They use three types of motor—the Rolls Royce 75 horsepower, a Gnome 80 horsepower, and a 100 horsepower Monosupape for the two seaters and the 80 Gnome for the single seaters.

STATEMENT OF THOMAS A. HILL.

Mr. HILL. My attention was first attracted by the cross-license agreement of the Manufacturers' Aircraft Association on or about July a year ago, at which time I published some criticism of the iniquitous effect of such an agreement for the reason that I knew the patents affected by the agreement were not the dominating patents in the aircraft art.

This was followed by a conference at Judge Crisp's office in New York. After conference with Mr. Coffin in Washington, and conferences with Secretary Daniels in Washington and Admiral Taylor and others. But I found it impossible to accomplish anything.

Later on, toward the end of the year, I was asked by Mr. Gutzon Borglum to assist him in some investigations which he said President Wilson had requested him to make, in the matter of the aircraft situation. I told him of my objections to the cross-license agreement and of the fact that I had brought the matter to the attention of the Aeronautical Society of America, which had taken some action, and I came to Washington a number of times to confer with Mr. Borglum in the hope of having the matter brought to the attention of the President.

Again after Mr. Snowden Marshall had been appointed by the President I went over the matter. I received a letter from Mr. Marshall stating that he had been requested to get my views at the instance of Mr. Stebbins, and again I came to Washington and went over the ground with Mr. Marshall and told him that if he would provide me with the necessary records I would gladly give him a full,

complete, accurate, impartial, technical report, such as the Government should have before paying any money in the guise of royalties.

Following this I conferred with Col. Harris, who, I understand, was the legal adviser to the Aircraft Board; Mr. Montgomery, who, I understand was the legal adviser of the Signal Corps; Mr. Potter, and others, and I again conferred with them and discussed with them the substance of the report which I drew for Mr. Marshal's consideration and for presentation with his report to the President. I found no one who could take actual exception to the recommendations in my report, and while the report embraced only one method of dealing with the situation, it is clear to my mind that there is no excuse, nor has there been, for the procedure worked out under the cross-license agreement.

For instance, I have not been able to get any record of any competent investigation leading to any conclusions as to the probable necessity or value of any of the so-called inventions covered by the agreement. In other words, no one seems to have actually ascertained, as a matter of fact, that the so-called improvements covered by the cross-license agreement were actually of any need or merit to the manufacturer or aircraft, nor which of them were of need or merit. I am not aware that any competent report has been rendered to determine whether or not such alleged improvements, if necessary, and if actually used in the manufacture of aircraft, were protected by valid patents claims, or to what extent, nor am I aware of any competent investigation resulting in a determination of the probable value of any such validity claimed necessary and actually incorporated improvements.

Now, my experience of upward of 20 years as a patent lawyer enables me to say, without fear of contradiction, that such an examination is absolutely essential in order that the Government might determine what it should pay, if anything, for the use of these alleged patented improvements, and to illustrate the shortcomings and iniquity of this cross-license agreement in one particular let me point out the instance of the Janin patent. Here is a case where some years ago an interference was declared between Curtis and one Albert S. Janin, of Staten Island, as to who was entitled to the broad patent covering the use of a central boat beneath an aeroplane superstructure, having side floats for lateral balance. It is perhaps the most underlying and basic patent in the water-flying art. My connection with the case begins with a time after the testimony had been taken in the interference proceedings, and the first tribunal of the Patent Office decided in favor of Curtis. This case was bitterly contested through the highest court of appeals and finally resulted in favor of this poor carpenter, Janin, of Staten Island. Curtis was held not to be the first inventor and lost his rights. Recently the Curtis Co. entered into a contract with Janin, and paid him \$1,000 for an option to purchase these rights for \$70,000, or to take a license for \$15,000. The Curtis Co. does not own any of these rights to-day, and yet this is a concrete illustration of a controlling and dominating patent, recognized by the Curtis Co. and yet not embodied in the cross-license agreement; that is to say, if the Government pays these royalties under the cross-license agreement it will yet have to account with the dominating patentee.

The same may be said of other patents, such as the Forber and Mayer patents, and others which can readily be located in the prior art, so that your committee will see that the agreement does not contemplate the controlling patents, as the Government has been led to believe, and even though the Government were to pay royalties under this agreement it would yet perhaps have to settle very heavily in royalties under patents not covered by the agreement.

This only deals with the purely technical and legal aspect of the matter to a limited extent. The far-reaching effect in a popular sense with regard to this cross-license agreement is, as very ably pointed out by Hon. Charles S. Thomas, in the Senate Chamber, that it discourages inventors by enabling a few powerful interests to force the aerodynamic inventors of the country to yield under pressure of control by this combination.

My recommendation to this committee is that the attorneys and others who have had anything to do with the creation of this cross-license agreement be called upon to produce before this committee every record and transaction in any manner connected therewith, in order that this committee may ascertain what investigation, if any, has been made as to the probable merit, necessity, value, legality, and other qualities of the patents involved. I will then gladly, at the request of the committee, go over these matters and be glad to give the committee the benefit of my personal judgment as to the merit of any such investigations or reports; and if these investigations or reports—assuming that something of that kind has been done—do not appear to be of the character required under the circumstances, I gladly offer my services to this committee, providing any necessary disbursements are paid, to make these investigations and to render a competent report thereon, without any compensation whatsoever, purely in the interest of the Government and in justice to all concerned.

This would probably take considerable time; but it does not seem possible that the committee can competently terminate its investigation without this is done, unless the committee simply report that such action has not been taken and condemn the agreement because of such failure.

As to the action of the Federal Trade Commission and the Patent Office in the suppression of patent applications, about a month ago I called the attention of Senator Thomas to one or two instances which, to my mind, illustrated laxity and incompetence in dealing with the suppression of patent applications supposedly of value to the enemy in this war. One, in particular, to which I referred was the case of John Samotej, Serial No. 234596, a patent application filed for improvement in the manufacture of thread gauges. This is a case where a couple of Polish young men, brothers, hit upon the idea of manufacturing gauges automatically for contractors supplying ordnance shells to the Government. These gauges are used for examining the threads in the shell, and are necessary in order that the threads be accurate to a considerable degree. The invention, therefore, is one that is of great importance in the manufacture of war material. I am advised that these gauges usually cost considerably upward of \$100, but that these inventors were actually able to produce them more perfectly and automatically in less time

at something less than \$7 apiece. The invention, therefore, was undoubtedly of unusual merit. That invention relates to a simple machine which in principle was not unlike previous machines in the prior patented art, but it differed in its operation and in the method of producing the gauges automatically in a unique particular, which made it possible to produce such gauges with extreme accuracy, I understand, to within one ten-thousandth of an inch.

At the time the matter was brought to my attention as a patent lawyer there was some quarrel between the brothers, one of whom invented the machine and the method, and I was brought into the case through the civil lawyers in New York. Recognizing the apparent value of the invention and its importance to the country and to our allies at war, I unhesitatingly recommended that an application for a patent be filed by the true and first inventor or inventors in accordance with the law provided for such procedure, and that a request be made that the application be kept secret in order that information might not leak out and reach Germany, who would profit greatly, not only in the economy in producing such tools but in the speed with which such tools might be produced. At the urgent request of the civil counsel in the case, I made a special trip to Washington to file the application personally and requested one of the assistant commissioners of patents to mark the case for suppression, which means that the application would be prosecuted to allowance and then withheld from publication, the inventor having the same rights under the allowed application as if his patent had been actually issued, but this procedure would avoid any publicity of the invention. There was no other way in which Germany could learn of the secret, as the tools were not being sold or used in any general way, and it could not be ascertained by looking at the gauges how the machine operated. I am advised that one or two machines were made in Toronto for the use of the Canadian Government, and that many of the gauges have been used by the British Government, and very large quantities by contractors to the American Government, but all of these operations had been guarded with great secrecy.

After the application had been filed and the request for suppression made as aforesaid, I received a notice from the Patent Office stating that it would not be suppressed, as it was not regarded as of sufficient importance.

I replied to this by an explanation substantially as above set forth and actually gave the names of contractors to the American Government who were using large quantities of these gauges, but with no further result. Following this the patent application itself was rejected by the Patent Office, but in this particular there is no special grievance, for the reason that in filing the application the claims were so worded, and properly so, to bring out anything in the prior art which might affect a patent issued on the invention. Accordingly the rejection of the claims was proper. I thereupon made another trip to Washington and took the matter up with the examiner in charge of the patent application, having previously mailed to the Patent Office an amendment to the application containing new claims which could be allowed in the case.

In my conference with the examiner, who very courteously examined into the merits of the points I raised, the value of the invention

I think was appreciated. At any rate, he gave me his verbal assurance that he believed the claims were allowable, and even suggested that I add some further claims covering the method as well as the machine, subject to the possible requirement that a further application be filed. I have no complaint as to this action by the examiner.

I thereupon saw Mr. Smith, of the Patent Office, to whom the matters relating to the suppression of patent applications are referred, and told him of the grave mistake that was being made in refusing to suppress this application, and discussed with him other cases wherein I had filed a complaint.

Mr. Smith referred me to Maj. Decker. After having listened to my story and, apparently, having been impressed that the Patent Office was in error—after repeating my story to Maj. Decker he also seemed to be impressed with the error of the office, and told me that the matter would be again taken up before the board next Tuesday, which fact I reported back to Mr. Smith, and there the matter now stands. This case serves to illustrate an instance where suppression was clearly proper, important to the Government, but yet refused and stands refused at the present time.

Another illustration, showing an opposite state of affairs. This involves the patent application of Carl Weaver, serial No. 169648, for concrete structures and method of constructing same. This inventor was not my client, but is an assignor to the Torcrete Shipbuilding Corporation, which is a subsidiary corporation of one of my clients. The assignees some time ago received notice from the Patent Office that this invention would be suppressed, and any publication by the inventor, assignee, attorneys, etc., would be punished by \$10,000 fine or 10 years' imprisonment. Naturally the receipt of this notice by the corporation, who were then engaged in shipbuilding indirectly for the Government, aroused much embarrassment, and the president of the company called me up promptly to know what it meant. I immediately came to Washington and took the matter up with the Washington associates of the attorney of record in the case and explained that I had advised my clients to discontinue operations and that it was wrong on the part of the office to interfere in this way with the work of such great importance to the Government, as a particular tank ship which was then being built by the assignee was to be used for the transportation of oil from Tampico, Mexico, to New Orleans, La., for Government use.

Subsequently a permit was obtained which recited that the order of the Commissioner of Patents was dismissed to the extent of granting permission to make such disclosure as might be necessary, and that all due precautions be taken to otherwise safeguard the invention from publication. The permit, however, did not specifically state that the assignees might proceed with the construction of vessels where permits were obtained from the Emergency Fleet Corporation, and the parties affected, as a precautionary measure, and to avoid possible conflict with Government interests, therefore deemed it necessary that I should again take the matter up with the Patent Office for a broader permit, which I have done to-day.

The only object in citing the preceding case was to show that this is an instance where suppression was applied unnecessarily, so much so, in fact, as to interfere with important Government operations.

whereas had they communicated first or investigated the records the error might have been avoided and delay and embarrassment in the Government work also avoided.

There are many other cases that might be cited. In some cases these suppressed notices come to the inventor and his assignee long after considerable publicity of the invention, and sometimes under peculiar circumstances. The fact remains that the present practice of suppressing pending patent applications without due investigation, and in refusing to suppress others under warrantable circumstances, leaves the inventors of the country in embarrassment and is annoying to an extent which drives them into other fields of original research. In other words. I have in mind a case in New England where an applicant for patent was restrained from further operations after considerable money had been invested, and this man is a nationally well-known inventor, who now takes the position that he will do nothing further in matters connected with the war, as it is not fair to those who back his enterprises, and it leaves him without any assurance as to where he is going to get off.

This is now rather generally the view of a great many inventors. There is no doubt that certain types of inventions should be suppressed from publicity, but many which are now suppressed are of very dubious value to any Government, and it seems that this work should be done with greater care; and I have even gone so far as to recommend that where inventors are put to a loss of considerable money because of such suppression some basis of remuneration should be provided to keep their interest in these lines of research and for aiding in scientifically prosecuting the war. In other words, if a man's invention is of sufficient merit to warrant suppression because of its probable value to Germany, then the suppression of that invention and the hardship entailed upon the inventor should warrant the Government at least in striking a medal to his honor in recognition of signal service or in reimbursing him at least to some extent for the legitimate actual expenses, which he would otherwise lose.

These are considerations which might well be worthy the consideration of this committee and are points which have developed in my mind as a result of intercourse with many inventors, with whom I am in daily contact, and have been for upward of 20 years last past.

I repeat, if there are any other matters which in the mind of the committee I can investigate or report upon for their benefit, I will gladly do so, and will ask for absolutely no remuneration except to the extent of such actual disbursements as may be incurred.

(Whereupon, at 12.15 o'clock p. m., the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

MONDAY, JULY 15, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met pursuant to adjournment, at 10.30 a. m., in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN A. JORDAN.

The CHAIRMAN. Mr. Jordan, what is your place of residence?

Mr. JORDAN. Sacramento, Cal.

The CHAIRMAN. What is your business?

Mr. JORDAN. Constructing engineer. Lately I have been engaged in the construction of aeroplanes for the Government.

The CHAIRMAN. How long have you followed the profession of construction engineer, and where?

Mr. JORDAN. Oh, in San Francisco mostly, in Buffalo and Chicago, for about 25 years.

The CHAIRMAN. In connection with what company, if any, have you been engaged in aircraft production?

Mr. JORDAN. The Andermat Aeroplane Co. That is a built-up name of different parties concerned. It is located at Sunnyvale, Cal. That was in 1915, I think.

The CHAIRMAN. You were then engaged in aircraft construction prior to our entrance into the war?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. And after that, what company?

Mr. JORDAN. After that I was with the Liberty Iron Works at Sacramento as a 30 per cent stockholder and as general manager.

The CHAIRMAN. Did you, at any time, have any conferences with the aviation authorities in Washington since our entry into the war with regard to aircraft production?

Mr. JORDAN. Yes, sir. I came on to Washington to solicit a contract. After we got our plant in shape.

The CHAIRMAN (interposing). When and where?

Mr. JORDAN. I came after we got our plant organized. On our first arrival I introduced myself to the Aircraft Production Board. They were in session in the War Department Building at that time. That was about July 27, 1917. We sent our cards in, the president of the company and myself, and shortly afterwards Mr. Deeds and Mr. Waldron came out.

The CHAIRMAN. Who was the president of the company?

Mr. JORDAN. Mr. Henderson was the president of my company. Mr. Deeds and Mr. Waldron were on the Aircraft Board at that time and assumed to speak for the board. They told us flatly that we could not get a contract; that all arrangements had been made as to where they were going to place contracts; that the companies had been selected. That was about the end of July a year ago—1917.

The CHAIRMAN. Did they give you the names of the companies?

Mr. JORDAN. No, sir.

The CHAIRMAN. Did you ask for them?

Mr. JORDAN. No, sir. I proceeded to argue that we people on the Pacific coast had plenty of mechanics and plenty of materials where-with we could build airplanes, with some exceptions, principally the steel and wire; that they were using a large number of the school machines at San Diego and that another school was about to be established, and it seemed foolish to send clear across the continent a finished machine when the spruce and heavier materials, the bulky materials, were already on the coast. I said that all they had to do was to ship steel, wire, etc., in order for us to construct the aeroplanes over there. We were making motors that were satisfactory out there at that time—the Hall-Scott motor made in Berkeley, Cal. I argued along those lines, but they persisted in saying that they had made final arrangements with other manufacturers. Henderson then got disgusted and went home, but I hung on. I said that there was a crying need for aeroplane factories to produce aeroplanes and also to drill mechanics in aeroplane construction on the Pacific coast. They were shipping at that time from three to four aeroplanes in one car, and those aeroplanes were shipped at tremendous expense from Buffalo, N. Y. After a long session and considerable dickering back and forth—in fact it was about at the end three months—I got a contract.

I had several sessions with Deeds and Waldron before that, but always with the same result. I hung on for the reason that I was convinced that if we were going to have aircraft schools on the Pacific coast, we could bring over in a single carload materials for 100 planes, instead of three completed aeroplanes in a car, and that would be much better business. It costs \$400 to \$700 each to get the individual airplanes from Buffalo. That was a waste of money. They were paying to the Wright-Martin concern out there \$1,000 more on the theory that construction was more expensive than in the East.

The CHAIRMAN. Just explain that, please.

Mr. JORDAN. Well, for instance, the price in Buffalo was \$4,750. They paid the Wright-Martin concern \$1,000 additional.

The CHAIRMAN. Where were they located?

Mr. JORDAN. In Los Angeles. So I pointed out to these people of the Aircraft Board that there was no necessity for that; that our workmen on the Pacific coast are quite as efficient and that we do not pay them any more money. The spruce that they paid a very large freight rate on to get it to Buffalo is grown on the Pacific coast. I told them that what they would have to ship us was linen and the steel. Of course, we all know that the freight on the knocked-down stuff or raw material is much cheaper than on the assembled product. I argued along those lines and finally, after much persuasion, Chairman Coffin

took our proposal up with Gen. Squier. Gen. Squier agreed with me, and he said that it was manifest that I was correct. He said, "We ought to have trained mechanics on the coast. We have one school, and we should establish others. There is no reason why you should not have out there trained mechanics to build airplanes and to repair them." Finally I got a contract for 300 airplanes..

The CHAIRMAN. At what price?

Mr. JORDAN. \$4,750 each.

The CHAIRMAN. What type?

Mr. JORDAN. The J N 4D school machine.

The CHAIRMAN. With what engine?

Mr. JORDAN. The Curtiss engine.

Senator REED. Is that the same kind of machine that the Wright-Martin people have been making for \$5,700?

Mr. JORDAN. Substantially the same kind of machine. There is no difference in the manufacturing cost. There were some refinements and some differences in details.

The CHAIRMAN. Do you know how many machines were covered by the Wright-Martin contract?

Mr. JORDAN. I do not know.

Senator REED. What were they making?

Mr. JORDAN. The J N 4A.

Senator REED. And what were you making?

Mr. JORDAN. The J N 4D. It is practically the same machine. Ours was a later machine. There was no material difference. The aerolon in the lower wing of the J N 4A was not in the J N 4D. The Wright-Martin machine had an aerolon in the lower wing. That was a matter that would not cost \$10 in addition and yet they gave \$1,000 more for that machine. I objected to that.

Senator REED. Why?

Mr. JORDAN. Because I did not want the Pacific coast to get a black eye.

Senator REED. No; I do not mean that. You said you objected to something. Do I understand you to mean that you objected to this part of the plane?

Mr. JORDAN. Oh, no; but as an engineering problem it is absolutely useless in that type of machine. That is, the aerolon in the upper wing is all sufficient.

The CHAIRMAN. Did your objection go to the price?

Mr. JORDAN. I did it on the theory that people thought we could not do the work on the Pacific coast as well or as cheaply as they could on the Atlantic side. I have some very interesting correspondence along those lines.

The CHAIRMAN. Have you that correspondence here?

Mr. JORDAN. Some of it.

The CHAIRMAN. With whom did you have that correspondence?

Mr. JORDAN. With Senator Phelan. They set up the argument that we could not do it as cheaply on the Pacific coast.

The CHAIRMAN. When you say "they" whom did you mean?

Mr. JORDAN. Deeds and Waldron. They were the Air Craft Board, so far as letting these contracts were concerned. There is no question about that. They went through the formality of passing it

through the board, but their recommendations were absolutely final except in my particular case. I learned that much. After I got this contract both Waldron and Deeds told me, and so did Montgomery, who is another one of the particular outfit, that I would not be able to carry out the contract. I said, "I will carry it out if you will help me to get the stuff." I had begun to realize that we had a tough proposition ahead of us. I said, "If you won't block me, and will assist me to get the steel and tubing, I can carry out the contract." This tubing is made in the East. We have no tubing, wire, or cable manufactured out there. They said, "You can not depend upon us; we have all we can do ourselves." I said, "All right."

The CHAIRMAN. State what, if any, difficulties you encountered as to the receipt of needed material from the East after you began work on your contract?

Mr. JORDAN. Now, Senator, if you will permit me for the sake of continuity to go ahead with my story, I believe that I can get along better.

The CHAIRMAN. Yes; go ahead.

Mr. JORDAN. Finally I got the contract signed up. I said to Montgomery, who was preparing the contract, "Where are my plans and specifications?" He sent me to a man by the name of Shepler. Shepler said, "You can not get them here; you will have to go to Buffalo." I said, "That is a little bit out of the ordinary: I have just signed a contract, and ordinarily you would have the plans and specifications for me and a copy should be attached to the contract." I ran into Lieutenant Farwell. He was Deeds' confidential man. Farwell said—this was before I got the contract—"You will have to join the association, the aircraft association." I said, "What is that?" "That is composed of all the aircraft builders who are doing Government work."

The CHAIRMAN. That had reference to what we call the cross-license agreement?

Mr. JORDAN. Yes. He proceeded to explain about that arrangement; that I was to pay into this concern about \$240, as I now remember it, on every aeroplane we constructed.

The CHAIRMAN. Were you required to join it and pay an initiation fee?

Mr. JORDAN. I do not think there was any initiation fee. I said, "That is not business. The Government has to pay for that. I will add it to my price." I said, "You know very well that these patents do not amount to a row of pins; that the Langley patents cover practically everything except the curvature of the wing, Montgomery's patent covered these, and between these two all things necessary in the plane." He said, "I do not know anything about that, but I know what you have got to do." I said, "All right, we will see about that." So, a day or two later I got the contract, and I had to go to Buffalo to get the plans.

The CHAIRMAN. To whom did you apply?

Mr. JORDAN. To the Curtiss Co. I went up there and they told me that I would not only have to pay \$240, but 1 per cent additional to them, for the use of the plans and specifications. So I said that I

would not do anything of the kind. I came back to Washington and finally succeeded in getting them without making any payments whatever.

Senator REED. Tell us about that.

Mr. JORDAN. I have documents which I will send you. I had them put their demands in writing.

The CHAIRMAN. Who said that?

Mr. JORDAN. Well, those things are down at the New Willard Hotel.

Senator NEW. You spoke of Mr. Shepler.

Mr. JORDAN. Yes, sir.

Senator NEW. Did I understand that name all right?

Mr. JORDAN. Yes, sir.

Senator NEW. Was that the Shepler who was afterwards brought into the service?

Mr. JORDAN. Yes, sir. He was then in the service.

The CHAIRMAN. He was in the service, but he had not been commissioned. Deeds and Waldron at that time were not in the Army service?

Mr. JORDAN. They just came in.

The CHAIRMAN. The first letter that you have produced here is dated September 26, 1917, signed by Mr. S. D. Waldron, Colonel, Signal Corps, and reads, as follows:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 26, 1917.

Mr. W. A. MORGAN,
Curtiss Aeroplane & Motor Corporation,
Buffalo, N. Y.

DEAR SIR: This will introduce Mr. John A. Jordan, of Sacramento, to whom the Aircraft Production Board has recommended that an order be given covering 300 J N 4D airplanes. Please give Mr. Jordan one complete set of blue prints for the J N 4D plane, together with bills of material, material specifications, and any other special information that he may need to enable him to get quickly into production.

Mr. Jordan has filed a bid with the Chief Signal Officer on these 300 planes at the price of \$4,750, each exclusive of engine, but with engine mounted and the plane complete, ready to fly. He has filed with his bid an agreement to forfeit 5 per cent of the price of any plane not delivered according to the following schedule of deliveries: October, 30; November, 150; December, 120.

We realize that it may be difficult for you to take care of our requirements for complete planes, as well as ship engines to California on this contract. Please make a record of the schedule on which this contract is placed, advising us as to your ability to meet it on the basis of one engine per plane, so that where you will be unable to meet it we may make arrangements for the acceptance and shipment of planes minus engines.

Very truly, yours,

S. D. WALDRON,
Colonel, Signal Corps.

Mr. JORDAN. You will observe the close relations indicated by the letter. Waldron gave Curtiss Co. all the information as to price, etc., of my contract, which was supposed to be confidential.

The CHAIRMAN. You presented that letter, did you?

Mr. JORDAN. Yes, sir; to Mr. Morgan, of the Curtiss Co., at Buffalo.

The CHAIRMAN. On the 29th of September you received a letter addressed to the Liberty Iron Works, Cal., attention of Mr. John A. Jordan, which reads as follows:

[Curtiss Aeroplane & Motor Corporation—aeroplanes, hydroaeroplanes, flying boats, aeronautical motors.]

BUFFALO, N. Y., *September 29, 1917.*

LIBERTY IRON WORKS,
California.

Attention of Mr. John A. Jordan.

GENTLEMEN: Referring to conversation to-day in regard to blue prints, bills of material, etc., as advised you, the cross-licensing agreement requires a royalty to be paid of \$200 on each machine you build and sell, which on the 300 you have under contract will amount to \$60,000.

This goes to the Aircraft Association, but until you are a member of that association the Curtiss Co., or whomever you obtain your blue prints from, is responsible to the association for that royalty.

In addition to the \$200 section D, article 8, in reference to payments to the company, reads as follows:

"Each subscriber agrees to pay such amount, or amounts, as may be payable with reference to the use of specifications, drawings, and data as provided in paragraph 6 hereof, including the royalty payments therein provided for, but the 1 per cent payment on account of the use of such specifications, drawings, data covering any one model shall cease when the total by all users shall aggregate \$50,000."

This means on your contract there would be about \$14,000 that you would be obliged to pay for the blue prints and specifications, although you understand these payments are not necessarily made in advance, as our Mr. Guy explained to you to-day. A deposit should be made of about 10 per cent of the total in advance.

Yours, very truly,

W. A. MORGAN,
Vice President and General Manager.

The CHAIRMAN. On the same day you received another letter accompanying what was said to be a complete set of J N 4D's drawing blue prints, bill of materials, material specifications, finish specifications, alphabetical and numerical parts list. You were notified that you would be supplied with all new and changed prints on this model as soon as released from production. There is also an unsigned receipt accompanying the letter acknowledging the receipt of the above prints, etc. It does not seem to be signed.

Mr. JORDAN. No. I refused to sign it for the reason that I did not get the prints.

Senator REED. Why didn't you sign it?

Mr. JORDAN. I put in three days investigating and checking those blue prints. It is necessary in engineering to check the blue prints to see that these details fit in the general assembly. Now, they would not fit. I had a large number of duplicates furnished me. They made a mistake in giving those things to me. There were almost 600 of them. I said to this man Mueller, Curtiss Co.'s engineering manager, "Why don't you put this in 25 or 30 prints and let us get away?" I said that that would be ample, and then we could make the rest ourselves in Sacramento. He said, "This is our system." I said, "You have not got them all here. According to your lists there are many missing, and you have a lot of academic prints showing details that are a sequence in assembled parts." I referred to prints of standard screws, brads, nails, etc. "I particularly want the print of the nose plate and the general assembly print." He said, "We

have not released the nose plate." The nose plate is substantially the foundation for the engine. It is of high-grade steel one-sixteenth of an inch thick. That has to be a very efficient piece of steel, a fine piece of material, and well constructed. That nose plate is absolutely essential. You can not build a machine without it. That print was not furnished until two months later. They claimed that it was "not released." I had voluminous correspondence over getting that nose-plate print.

(The letter referred to is here printed in full, as follows:)

[The Curtiss Aeroplane Co., aeroplanes, hydroaeroplanes, flying boats, aeronautical motors.]

BUFFALO, N. Y., September 29, 1917.

LIBERTY IRON WORKS,
Sacramento, Cal.:

Attention, Mr. Jordan.

We are handing you herewith a complete set of J N 4D's drawing blue prints, bill of material, material specifications, finish specifications, alphabetical and numerical parts list.

You will be supplied with all new and changed prints on this model as soon as released for our own production.

CURTISS AEROPLANE & MOTOR CORPORATION,
G. H. MUELLER, *Engineering Manager*.

CURTISS AEROPLANE CO.:

Mr. G. H. MUELLER: I hereby acknowledge receipt of the above prints.

NOTE.—Parts 15124 and 14900 are not included in this set, as these parts are not yet released, but will be forwarded within a week. We are also inclosing 11602 model J N 4A plan drawings as a reference print

Senator REED. Where is that correspondence?

Mr. JORDAN. That is in Sacramento.

The CHAIRMAN. It is a part of this story?

Mr. JORDAN. Yes; the thread of the story is carried through in that correspondence, of making demands and calling attention to deficiencies, to the bad drawings, and the impossibility of constructing airplanes from the drawings which they gave us. It was absolutely impossible. We had to reform the whole business.

The CHAIRMAN. Before you leave your first visit to Buffalo, please tell the committee whether you executed the cross-license agreement.

Mr. JORDAN. No, sir; I did not. They wanted \$75,000. I said, "I do not purpose to pay it unless you show me." They said, "Everybody else is doing it." I said, "Well, I won't do it unless there is some reason for it." Then I went back to Washington and thrashed it out with Messrs. Coffin and Montgomery. I went to Montgomery and explained to him the whole situation. He said, "I do not know. It appears that there is a cross-license agreement in existence here." I said, "I never subscribed to it; I have a perfectly good contract signed by the proper authorities, giving me \$4,750 each to build 300 aeroplanes. I do not purpose to give \$75,000 to Mr. Curtiss, or Wright, or anybody else, unless there is some reason for it." He said, "Of course, you signed the contract; we will see that you get the plans and specifications." He was very much put out about it.

Senator REED. Put out about what?

Mr. JORDAN. At the position I had taken.

Senator REED. Who was this?

Mr. JORDAN. Montgomery. Of course, that is my own idea. He was apparently much put out.

The CHAIRMAN. Was anything said about the Government paying this royalty in the event you signed the contract?

Mr. JORDAN. Nothing was said.

The CHAIRMAN. As to whether it would be added to your contract price?

Mr. JORDAN. Nothing was said.

The CHAIRMAN. Was anything said by the Curtiss Co.?

Mr. JORDAN. No, sir.

The CHAIRMAN. What was your understanding?

Mr. JORDAN. I understood that I was not required to pay any royalties to anyone, or any commissions. Afterwards I had reasons, after discussing these matters, to believe that it was going to be a hard proposition to fulfill my contract. I made up my mind it was going to be hard sledding for me.

The CHAIRMAN. Did you discuss the cross-license agreement with Shepler?

Mr. JORDAN. No, sir; only with Farwell.

The CHAIRMAN. Montgomery, you mean?

Mr. JORDAN. That was after I came back I talked with Montgomery.

The CHAIRMAN. I am talking about that.

Mr. JORDAN. Yes. I discussed it briefly with him. I told him I would not pay it, but he did not say very much. He sent his brother, another Montgomery, who was a lawyer for the board, with me to Buffalo to get the plans and specifications.

The CHAIRMAN. That was the second visit?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. When was that.

Mr. JORDAN. That was about a week later.

The CHAIRMAN. About the first week in October?

Mr. JORDAN. Yes. We got to Buffalo, but Montgomery did not take me with him to visit the Curtiss Co. He came back to the hotel and said, "You can get the plans and specifications any time you go after them." I went down there to get the plans and specifications. They gave me another set, not the set that I had already checked, so that I had to go over the whole thing again.

The CHAIRMAN. What reason was given for doing that?

Mr. JORDAN. No reason at all. I had the other ones all bundled up and tied with a string around them, and I had asked them to keep them for me in that shape until I was ready for them. They promised to do so, but when I got back it seems they could not find my bundle. When I got to Sacramento I found they were in bad shape.

The CHAIRMAN. Did you go from Buffalo to Sacramento?

Mr. JORDAN. Yes. The time was short in which to do the work. Then I took it up with the different manufacturers of parts. They assured me they would be only too glad to have our business. Robey, of Cleveland, wanted all our business. He claimed to be a manufacturer in Cleveland. He was strongly indorsed by the department by a young man named Cook in the department. Cook was production engineer for the Pacific coast for the Aircraft Board. Cook was anxious that I should deal with Robey. He said Robey could furnish

all the parts. That dragged along for weeks, and finally I found out he could not furnish anything on time.

The Erie Specialty Co., of Erie, Pa., agreed to furnish bolts. Then I got a wire saying that they could not furnish them. Still another wire saying they could do so. They then shipped us bolts that did not conform to specifications.

Senator REED. Do you know any of its connections?

Mr. JORDAN. No; I do not.

The CHAIRMAN. Who recommended that company?

Mr. JORDAN. This man Cook brought a whole list of manufacturers who could produce those parts. It was a very serious question because of the steel situation and also because of the dies.

Then the Buffalo Pressed Steel Co. came in. That, as I understand it, is an auxiliary of the Curtiss plant. They are closely connected, anyhow. They managed to get possession of all of the $3\frac{1}{2}$ per cent nickel steel used in the axles of the airplanes.

The CHAIRMAN. What concern is that?

Mr. JORDAN. The Buffalo Pressed Steel Co. First they refused to furnish any, but finally they said they would furnish a limited number for \$14.50 each. That was fully three times the value of them under fair conditions.

The CHAIRMAN. Did you secure any?

Mr. JORDAN. Yes, sir. We got five at a time, or altogether about 30 or 40, at that extravagant price.

Then there was the Lewis Spring & Axle Co. I think they are in or near Chicago. I may not have that right. They agreed to furnish the controls all complete, and were enthusiastic at first. A couple of weeks later they fell down absolutely and could not do anything. They finally did furnish some of them, which were very inferior in quality.

The CHAIRMAN. Now, from what source did you obtain your spruce and other materials for the wooden parts of the planes?

Mr. JORDAN. The spruce we got through the Government Wood Production Board, at Portland, Oreg.

The CHAIRMAN. Did you have any difficulties or delays?

Mr. JORDAN. There was no material delay in getting the spruce, but when it did come in it was bad. It was wet and green. It was poorly selected. There was great wastage.

The CHAIRMAN. Is the document that I now show you [exhibiting document] the proposed contract with the Curtiss Co. for the payment of \$200 for each airplane manufactured and a royalty of 1 per cent?

Mr. JORDAN. Yes; that is the original contract.

The CHAIRMAN. Which you did not execute?

Mr. JORDAN. No, sir.

(The contract referred to is here printed in full, as follows:)

This agreement, made this — day of —, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the —, a corporation of the State of —, having its principal office in the — of —, party of the second part;

In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, as designed and built by the party of the first part.

The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part 1 per cent of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs, and also to pay to the party of the first part the sum of \$200 for each and every aeroplane so manufactured, all such payments to be made to the party of the first part not later than the tenth day of each month for all aeroplanes or parts thereof manufactured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of _____ in payment of the 1 per cent charge on the first \$_____ of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of \$_____ shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of \$_____.

The party of the second part has also this day paid to the party of the first part the sum of \$_____, covering the payment of \$200 each for the first _____ aeroplanes to be manufactured by the party of the second part under such drawings and designs as hereinbefore agreed.

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used, by any person other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specifications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof, the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective corporate seals to be hereunto affixed the day and year first above written.

CURTISS AEROPLANE CO.,

By _____
Secretary and Treasurer.

By _____

By _____

The CHAIRMAN. When you refused to execute that contract, what, if anything, did Mr. Morgan, or the representative of the company, say?

Mr. JORDAN. They said they would not give the plans and specifications until I did execute it.

The CHAIRMAN. And that is why you came back?

Mr. JORDAN. Yes.

The CHAIRMAN. Who said that?

Mr. JORDAN. Mr. Guy. His signature is on that letter.

Senator REED. You have spoken of the difficulties you had in getting these materials?

Mr. JORDAN. Yes.

Senator REED. Can you tell us whether or not other airplane builders who had signed these contracts to pay these royalties, or whatever they may be called, were getting their supplies without difficulty from the same people?

Mr. JORDAN. The Curtiss Co. themselves furnished the Fowler Airplane Co. the same supplies.

Senator REED. Did you try to get them from Curtiss?

Mr. JORDAN. I tried. They absolutely refused to give me a screw or a bolt or anything else.

Senator REED. You mean the Curtiss Co.?

Mr. JORDAN. Yes, sir.

Senator REED. Who made that refusal?

Mr. JORDAN. Mr. Gay——

Senator NEW. Had Fowler & Co. signed the cross-license agreement?

Mr. JORDAN. I believe Fowler said they did. Fowler did pay Curtiss the 1 per cent demanded. He told me so.

Senator REED. Have you any correspondence with these various people showing that they were furnishing supplies to other contractors who had signed the cross-license agreement at the time that you were being refused supplies?

Mr. JORDAN. To my own knowledge I only know that they were furnishing them to Curtiss and through Curtiss to the Fowler Co. Fowler was getting them there through Curtiss.

Senator REED. What was he getting?

Mr. JORDAN. Certain clips and small parts.

Senator REED. Can you name them?

Mr. JORDAN. The Universal clip. He had a quantity there. I asked him where he got them, and he said from Curtiss. That is the clip, the largest single item used in the machine; that is, a greater number of those clips is used than of any other. Then there were the landing gear clips which were furnished by Curtiss to the Fowler Co. I speak more of the Fowler Co. because they are neighbors.

Senator REED. Did the Fowler Co. get contracts before or after you got yours?

Mr. JORDAN. Yes; before, a matter of a couple of months.

Senator REED. From whom did the Curtiss Co. get these materials, which they afterwards furnished to the Fowler Co.?

Mr. JORDAN. I do not know that.

Senator REED. And when you asked the Curtiss Co. to furnish these supplies, what reason did they give for their refusal?

Mr. JORDAN. They just absolutely refused. I have more correspondence. It is in the files in Sacramento.

Take this matter of the bent part, in the blue print. It is a most difficult matter for a draftsman to show the exact bending in the blue print. It can scarcely be done. Under certain conditions it can not be done. It is like a perspective down hill in a photograph. It is practically impossible. For that reason I wanted samples of these things so as to get the angle of bend.

Senator REED. You just wanted samples?

Mr. JORDAN. At first I wanted them in quantity. Then I asked for samples. Morgan said that he would give them to me, but Gay refused to do it, without giving any reason.

Senator REED. Gay is connected with the Curtiss plant?

Mr. JORDAN. He was the secretary.

Senator REED. He was the man you would naturally go to to get these things?

Mr. JORDAN. Yes, sir.

Senator REED. And they refused to give you a sample?

Mr. JORDAN. Yes, sir.

Senator REED. This occurred after you refused to sign the cross-license agreement and had come back to Washington, and at Washington had gotten a contract, notwithstanding you refused to sign the cross-license agreement?

Mr. JORDAN. No, sir. I had the contract before I refused to sign the cross-license agreement.

Senator REED. Now, as to these parts that he refused to let you have; can you give us an idea of their size? Can you state whether they were such things as could not be given to you without doing serious harm or injury; were they large or small things?

Mr. JORDAN. They were small parts.

Senator REED. Of what size?

Mr. JORDAN. Three inches each way, we will say.

Senator REED. These little steel clips?

Mr. JORDAN. These little steel clips; yes, sir.

Senator REED. In the making of a single machine you would require a great many of them?

Mr. JORDAN. Some 28 of this one particular clip.

Senator REED. This particular clip?

Mr. JORDAN. Yes, sir.

Senator REED. You tried to get more than one clip?

Mr. JORDAN. Yes; I wanted to get a quantity of them in order to get a start.

Senator REED. What is the name of that clip?

Mr. JORDAN. That is the Universal clip.

Senator REED. It took about 28 for one machine, you say?

Mr. JORDAN. Yes, sir.

Senator REED. How much is that clip worth?

Mr. JORDAN. About 30 cents.

Senator REED. And yet it was a very essential thing for you to have in order to get the proper angles and curvature?

Mr. JORDAN. Yes, sir.

Senator REED. Angles or curvature, which?

Mr. JORDAN. Angles and curvature, both.

Senator REED. And you could not get one?

Mr. JORDAN. No, sir.

Senator REED. Did that seriously handicap you?

Mr. JORDAN. We had to make a number of them and then figure it out.

Senator REED. Did you try to get other small parts of similar kind?

Mr. JORDAN. Yes, sir. We tried to get all the metal parts, the wing washers, in which the struts fit.

Senator REED. They were also little things?

Mr. JORDAN. Yes, sir. They weigh probably 2 ounces. They were drop forgings, necessitating dies. The making of a die takes a long time, but when it is once made you can make a million as well as you can make one, if you do not break the die. You can hammer them out. There is no reason, other than spite, why Curtiss could not pound them out for everybody.

Senator REED. Do you know whether or not he was furnishing them to others?

Mr. JORDAN. I do not know of my own knowledge.

Senator REED. These were little, simple things that, having once made the machinery to produce them, you could turn out like nails?

Mr. JORDAN. Exactly. Once the dies are made you can pound them out in indefinite numbers.

Senator REED. You have a lot of correspondence about that?

Mr. JORDAN. Yes, sir.

Senator REED. How long will it take to get it by wire?

Mr. JORDAN. Six days, I suppose. We will have to have an official summons.

(Informal discussion occurred which the reporter was directed not to record.)

The CHAIRMAN. If we were to call upon your corporation, the Liberty Iron Works, of Sacramento, for all correspondence up to March 1, 1918, bearing upon the procurement of metal parts, would that be sufficiently definite so that the concern could give us the letters that will really bear upon the question?

Mr. JORDAN. Yes; I think so.

Senator REED. How much delay did you actually suffer, as near as you can state, by virtue of the refusal of the Curtiss people to furnish these parts which they had in their possession?

Mr. JORDAN. In connection with the poorly made drawings, we suffered at least 90 days' delay there. What I kept telling Curtiss and Gay was that we could not make this stuff from their prints. I said, "Why don't you give us this stuff?" They were not making it from their own prints at this time.

Senator REED. They would not give it to you?

Mr. JORDAN. No, sir.

Senator REED. Can you go ahead and give the technical names of those parts that they refused to give?

Mr. JORDAN. The correspondence would show. Technically, it was clips, fuselage, landing-gear clips, and wing clips. That covers it.

The CHAIRMAN. How about the nose plate?

Mr. JORDAN. Yes; and the nose plate.

Senator REED. Did you ever get a nose plate from the Curtiss people?

Mr. JORDAN. No, sir. Along in December we got the blue print.

Senator REED. How much late was that on your contract?

Mr. JORDAN. I should have had it the 1st of October. There was no reason—and I say this advisedly—there was no reason why that drawing should not have been furnished when I was in Buffalo.

Senator REED. Why do you say that?

Mr. JORDAN. They were making it at that time, and it came out two or three months later without any material change.

The CHAIRMAN. What reason did they give?

Mr. JORDAN. That it had not been released, which does not mean anything at all.

Senator REED. When the Curtiss people refused to give these little pieces of material which you say were so essential, and refused to give you either the drawings or a sample of the nose plate, did you then appeal to any of the authorities here in Washington for assistance?

Mr. JORDAN. Yes, sir.

Senator REED. To whom did you appeal?

Mr. JORDAN. To Farwell, Montgomery, Shepler, and everybody that I thought had any influence to get them.

Senator REED. Did you appeal in writing?

Mr. JORDAN. In writing.

Senator REED. Have you that correspondence?

Mr. JORDAN. That is in the correspondence.

Senator REED. Will that be covered by this subpoena which we have been talking about?

Mr. JORDAN. Yes; if you get all the correspondence up to March 1, 1918.

The CHAIRMAN. What have you to say about the ultimate performance of your contract?

Mr. JORDAN. Well, we did not deliver, of course, anywhere near on time, but finally we did get to making them. My principal row with my own partners was that we were using material that I did not consider fit to go into the machines, and the inspector passed on them.

The CHAIRMAN. What materials were those?

Mr. JORDAN. Those same nose plates that we manufactured. I threw out several of them.

The CHAIRMAN. Where did you get them?

Mr. JORDAN. Made them. They did not suit me, so I threw them out. They were afterwards brought in and used and put in airplanes against my objection.

The CHAIRMAN. Your own airplanes?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. How could they be used without your consent?

Mr. JORDAN. I had resigned as manager during the battle. They hired as superintendent a former chief inspector of the plant, which I would not have done.

Senator REED. A Government inspector?

Mr. JORDAN. The Government inspector. When he came in he immediately swayed those inspector boys so that they passed everything and went out to the scrap pile and brought in everything. It was dead wrong.

The CHAIRMAN. Did you report that fact to the authorities here?

Mr. JORDAN. I have been reporting it ever since.

The CHAIRMAN. Have you correspondence with relation to that?

Mr. JORDAN. I reported it to the officers of the company first. I went out and saw Maj. Emmons at the flying field. He said that the inspection was rotten.

The CHAIRMAN. Where is he?

Mr. JORDAN. The Sacramento field. I found they were using bad material. I called attention to some of the things I was fearful of, such as welded nose plates.

Senator REED. Mr. Chairman, I think it would be a good idea to let Mr. Jordan get in mind the points which he wishes to bring before the committee, and in which he knows we are interested, and then let him appear before the committee later on, perhaps to-morrow afternoon.

(After informal discussion a recess was taken until 2.30 o'clock p. m. of the same day.)

AFTER RECESS.

At 2.30 o'clock p. m. the committee reassembled pursuant to the taking of recess.

STATEMENT OF EDOUARD DE BILLY, ACTING FRENCH HIGH COMMISSIONER, AND COL. TULASNE AND LIEUT. HENRI MARQUISAN OF THE FRENCH HIGH COMMISSION.

Senator NEW. Mr. de Billy, I have understood that you gentlemen have the same interest that all of us have in arriving at some sort of

program for the development of aircraft in this country so as to result in the greatest good to all of the allies. If there have been mistakes in our program in the past, we want to be able to point out those mistakes. We want to benefit and profit by our own mistakes, if we have made them, and in case you gentlemen know where mistakes have been made, we invite you to point them out to this committee, in order that we may base our recommendations upon them. You have had no preliminary conversations with any of the members of this committee that I know of, and I therefore scarcely know upon just what line to base an inquiry, but as we go along things will develop, no doubt.

The CHAIRMAN. I assume that you gentlemen represent aviation over here in this country.

Mr. DE BILLY. These gentlemen, Col. Tulasne and Lieut. Marquisan, do.

Senator NEW. Please state your name and your position in this country, Mr. de Billy.

Mr. DE BILLY. My name is Edouard de Billy, and I am a deputy high commissioner for France, and in the absence of Mr. Andre Tardieu, who is the high commissioner, and who is now in France, I am acting for him, so I am acting high commissioner, and Col. Tulasne is at the head of the French aviation section here, and Lieut. Marquisan is one of the officers under the orders of Col. Tulasne. As you know, these French officers, as well as the British officers, are here to give information and cooperate in the different aviation camps and schools, so as to be the direct link between the Aviation Section of the American Army and what is going on on the front, so as to give the most recent information from the other side.

Senator NEW. Have either of you had occasion to pay any particular attention to the American aircraft program?

Mr. DE BILLY. Yes. The commission are in very direct touch, and so are these officers with the Aircraft Production Board, as well as these officers with the aviation officers. Personally I am in direct contact with Mr. Ryan and Mr. Potter, and I do a great deal of work in connection with what is done in France, as well as in England, and we are asking, as you know, for a great many Liberty motors for the other side, so that the development of this proposition is very interesting for us and for all the armies.

Senator NEW. It is for all of us. We have a common interest, and that suggests to me the thought that if the representatives of any one of the allies have any suggestions to offer that will speed up things we want those suggestions made, in order that we may profit by them. I suggest, Mr. de Billy, that you proceed in your own way to tell this committee what you think should be done, particularly in reference to aircraft, both as to motors and as to planes.

Mr. DE BILLY. Mr. Senator, I will say a few words from a general point of view. As I am not a professional man, I will ask you to question these officers regarding details. I will first speak in regard to motors. I have not much to say that you do not already know, and the praise that I would give of the Liberty motor has been given by all the French officers, and that which is better than words is this, that the aviation section of the French Army is now asking from the American Aircraft Production Board a great many of those Liberty motors, so there is quite a good deal of competition between the

British and French as to the number of motors that can be delivered to the other side for all the different armies. As regards France, they have quite a number of demands, first, for the motors that will be used by the manufacturers of French airplanes, and, second, quite a number for the airplanes which are to be manufactured for the American armies.

The CHAIRMAN. May I interrupt for a moment? Do you French except to use the Liberty motor in the fighting plane as well as the bombing plane?

Mr. DE BILLY. Yes.

Senator NEW. That is, I presume, in certain types of fighting machines?

Mr. DE BILLY. Yes; in certain types. We are more advanced in France as regards the construction of airplanes than you are here, and so there have been quite a number of airplanes that the French manufacturers have been able to get of the American manufacturers previously. They can be fitted with motors, so there are two demands for motors and for airplanes for the American armies, and the enormous demand shows more than any words could what appreciation we hold the Liberty motor in.

Senator NEW. Mr. de Billy, you spoke of the French furnishing airplanes to the Americans in France.

Mr. DE BILLY. Yes.

Senator NEW. Can you tell us something of the number of airplanes that have been built in France and delivered to the American forces there?

Mr. DE BILLY. I have not the figures in my memory.

Col. TULASNE. About 1,000 French training planes and about 20 squadrons of 18 planes each of combat or war planes.

Senator NEW. What kind of motors were in those planes—the combat planes?

Col. TULASNE. In the combat planes there were Renault engines, Hispano-Suiza motors, and Canton-Una motors. Those are the three best motors now over there.

Senator NEW. The three best that the French have?

Col. TULASNE. Yes.

Senator NEW. Is it in part to relieve France of the necessity of furnishing those motors that you are asking for so many Liberty motors?

Mr. DE BILLY. Yes; because the program for the construction of airplanes is enormous.

The CHAIRMAN. Are the French also asking us to manufacture any Hispano-Suizas for them?

Mr. DE BILLY. No; we manufacture Hispano-Suizas.

The CHAIRMAN. I thought possibly you might need a little assistance there also.

Col. TULASNE. No; not that I know of; no. But I believe that France will ask you to give her some Bugatti motors. The Bugatti motor is now built in the United States.

Senator NEW. That is an Italian motor, is it not?

Mr. DE BILLY. The name is Italian, but the motor is French.

Senator NEW. The Liberty motors that you expect from the United States are to be used in the machines which the French will use themselves as well as in the machines that you expect to turn over to the United States?

Mr. DE BILLY. Yes. We are asking now for twice as many for our use as for the use of the airplanes that we have to get from you.

Senator NEW. You have tested the Liberty motor yourselves?

Mr. DE BILLY. We have tested the Liberty motor ourselves, and we have not only tested it as a machine, but we have fitted it into some of our planes and, for instance, in the Breguet plane it has given very remarkable achievement.

Col. TULASNE. The Breguet will be the main type of plane in which the Liberty motor will be used in France, because it is especially adapted for it and we made some tests and they gave very good results.

Mr. DE BILLY. It is a very rapidly climbing plane.

Lieut. MARQUISAN. It gave exactly the same result as the 400-horsepower Renault.

Senator NEW. Is the Liberty motor adapted to all the planes that the French make?

Mr. DE BILLY. No. If there is anything to criticize in the past, and you can always find criticisms somewhere, and I do not want to be considered as making a severe criticism, because, considering everything, the American Aircraft Board has done something splendid.

The CHAIRMAN. Do not hesitate to criticize things. That is what we want.

Mr. DE BILLY. If there was a mistake in the beginning, it was to believe that one motor could be adapted to every type of plane and that one type of plane was suitable for all purposes, but what your Aircraft Board is doing now and is doing with great success and with great wisdom is at the same time that they push the manufacture of the Liberty motor to the utmost possibilities, they are at the same time developing the manufacture of other types of motors.

The CHAIRMAN. They are now.

Mr. DE BILLY. Yes. They are certainly manufacturing the Hispano-Suiza, which is developing in great numbers, and I have no doubt that air planes will be designed to which the Liberty motor will be fitted for all purposes, but in order to save time it is perfectly wise to develop the manufacture of other motors immediately fitted to planes that actually exist.

Senator NEW. Then, the Liberty motor is highly regarded by the French?

Mr. DE BILLY. Highly regarded.

Senator NEW. Within certain limits; that is, for planes of certain types; the Bugatti, for instance.

Col. TULASNE. I believe all sorts of planes except some monoseater fighting planes, because it is not adapted to that plane. For other planes, such as bombing planes, Corps d'Armies, it can be used.

Mr. DE BILLY. As regards the motor, it is a 420-horsepower motor. It is now one of the best known motors which has been produced. It is the finest achievement which has been accomplished by the American Aircraft Board, and we are all very strongly impressed by it.

Senator NEW. The United States is also making motors of certain other types. For instance, we are making some Hispano-Suiza. Do you regard that as a good motor?

Mr. DE BILLY. Yes, sir; it is a very good 300-horsepower motor.

Senator NEW. The 300 horsepower, the 180 horsepower, and the 150 horsepower. The Le Rhone we are also making. Is that regarded by the French as a good motor?

Lieut. MARQUISAN. We use that motor for training planes, mono-seater planes.

Senator NEW. The Curtiss O. X.; do you know anything of that?

Lieut. MARQUISAN. Yes; I flew with it a great deal in San Antonio and in San Diego, and I think it is the only motor that I know of that could resist the high temperature of the southern schools in summer. It is an excellent motor for primary training planes.

Senator NEW. The temperatures, then, have their effect on airplane motors?

Lieut. MARQUISAN. A great deal.

Senator NEW. How would the temperatures affect the Liberty motor, in your judgment, Lieutenant?

Lieut. MARQUISAN. I think it will not affect it in France, because the temperature is not as high as it is here in some places, like Houston or Lake Charles.

Senator NEW. It would be affected by high temperature?

Lieut. MARQUISAN. Like the Hispano-Suiza and like most motors.

Senator NEW. What about the altitudes? In some motors the loss of power—

Lieut. MARQUISAN. In all motors.

Senator NEW. Yes; but in some more than in others, if I am correctly informed. The Liberty motors stand that test too?

Lieut. MARQUISAN. It seems to from the tests that have been made in France for the Liberty. It flew to 5,000 meters in a very short time and shows that they are not more affected than our best motors.

The CHAIRMAN. You speak very highly of the Liberty motor?

Mr. DE BILLY. Yes.

The CHAIRMAN. Do you base your statement on tests made in France?

Mr. DE BILLY. Yes, sir; certainly, and fitted in our Breguet planes it gave excellent results.

The CHAIRMAN. In the tests made in France did you make any changes in the parts or auxiliaries of the motor? For instance, did you use any other carburetor than the one we sent over with the engines?

Lieut. MARQUISAN. I think we just removed the carburetor from between the cylinders and put it outside.

The CHAIRMAN. Did that produce better results?

Lieut. MARQUISAN. Yes, it did. It gives better cooling, and about 30 horsepower more.

The CHAIRMAN. Thirty horsepower more?

Col. TULASNE. In fitting it to the motor it is much better that the carburetor be outside.

The CHAIRMAN. You think it would be a good permanent improvement to build them with the carburetor outside of the V?

Col. TULASNE. I believe it would be very good to have a series of tests with the carburetor inside and another series with the carburetor outside to make the comparison before taking any chances. I believe that we have not the troubles in France with the Liberty motor. In regard to all these troubles, you have some very good

reports by Maj. Muhlenberg to Maj. Kenly, who has it now in hand, about the tests of this machine.

The CHAIRMAN. Maj. Muhlenberg testified substantially as Lieut. Tabuteau.

Mr. DE BILLY. Is not that rather a criticism of the plane than a criticism of the motor?

Col. TULASNE. Yes.

Lieut. MARQUISAN. Yes.

The CHAIRMAN. The criticism they made was both as regards the combination of the Liberty motor with the De Haviland, the De Haviland having been originally designed for the Rolls Royce engine and, of course, it has been changed and they have had to make some changes to adapt it to the Liberty motor and we asked them particularly as to the plane, as to the motor, and as to the combination, so I think that is one of the troubles. Let me ask what type of plane the Liberty motor was tested in in France.

Mr. DE BILLY. In the Breguet plane.

The CHAIRMAN. Is that a two-seated plane?

Mr. DE BILLY. Two-seated.

The CHAIRMAN. Heavier or lighter than the De Haviland?

Mr. DE BILLY. Heavier and exactly the same type of machine.

The CHAIRMAN. The French use it for the same purpose that the English use the De Haviland?

Mr. DE BILLY. Yes.

The CHAIRMAN. Lieut. Marquisan, were you consulted in regard to the location of any of our aviation fields?

Lieut. MARQUISAN. No.

The CHAIRMAN. Were you, Col. Tulasne?

Col. TULASNE. For some fields, some of my officers were, and they gave their advice?

Senator NEW. I think that is all in reference to motors, unless there is something that some one of you gentlemen want to offer; and if not, we will turn to the planes.

Mr. DE BILLY. The only thing I would say is that we quite agree with the Aircraft Board in what is contemplated now, which is that by next spring there must be 500-horsepower engines in use, so this work on the airplanes is transforming so much, and the German aviators are doing so much to equal us that in order to get ahead of them we will have to fly next year motors of 500 horsepower, whereas now 400 is the highest. I think this is the program and it is the program of all nations.

Col. TULASNE. We are not in France working about these 500-horsepower motors. There are two of these motors—the Bugatti, which is built here in this country now at Elizabeth, N. J., at the Duzenberry factory, and another is the Canton-Une, which is not here in this country, and the French mission strongly recommends this motor now.

Senator NEW. Let me ask you if you have had any opportunity to test the De Haviland Four plane with the Liberty motor?

Col. TULASNE. Lieut. Tabuteau is with Maj. Muhlenberg at the Wilbur Wright field and he is testing this plane with the American commission.

Senator NEW. We took his testimony, as was just stated a few moments ago, at Dayton. He reported to us the result of his observa-

tions up to that time. Do you know whether any additional facts have been learned since Lieut. Tabuteau testified before this commission that change your opinion on the adaptability of the Liberty motor for use in the De Haviland plane?

Col. TULASNE. Nothing new.

Mr. DE BILLY. I think that we all agree that when the actual changes are made the De Haviland will be a good observation plane. Is that not your opinion?

Col. TULASNE. A good observation plane, but not a good fighting and bombing plane.

Senator NEW. That is one point that I very much wish to develop; that you think it will be all right for observation purposes, but that it will not answer the purpose of a bombing plane.

Col. TULASNE. Not very good for bombing. You can use it for bombing, but with a very slight loading of bombs, but not for a fighting machine.

Senator NEW. In other words, it is not a good type of combat plane?

Lieut. MARQUISAN. It is not intended for a combat plane. A good machine must be fitted for one purpose only.

Senator NEW. Perhaps I should not have employed the word "combat" there, but I used it in the sense that any machine which is used for bombing may be classed under the head of a combat plane, but the De Haviland is not a high-class bombing plane for the reason that it does not carry a sufficient load. Is that the idea?

Lieut. MARQUISAN. Yes.

Senator NEW. We are making in this country some Capronis. How do you estimate them?

Col. TULASNE. The Caproni with the Liberty motor is a high-class bombing machine.

Lieut. MARQUISAN. I saw it flying in Mineola a week ago last Sunday. We have three Liberties now, and I never saw a bombing machine with such a climb and speed, and I think it carries with five hours of fuel, it is estimated that it carried about 1,000 kilograms of bombs. This is only an estimate made by the Italian commission.

Senator NEW. The Caproni plane as manufactured abroad has carried the Isotta motor?

Lieut. MARQUISAN. They had two kinds of motor, the Isotta-Fraschini and the Fiat.

Senator NEW. It gives equally good results with three Liberty motors?

Lieut. MARQUISAN. It is much better. They have not yet made the test on long flights, but it seems to be all right.

Senator NEW. As to the Handley Paige, what opportunities have you had for observation of the Handley Paige plane?

Lieut. MARQUISAN. I carried on Saturday, the 6th of July, and that was the first flight that I saw.

Senator NEW. Were you in the plane?

Lieut. MARQUISAN. No.

Senator NEW. That is the only one you have seen?

Lieut. MARQUISAN. I have seen it on the front in France, but not with the Liberty motor.

Senator NEW. You were satisfied with the performance, were you?

Lieut. MARQUISAN. I think it is far from being as nice as the Caproni.

Senator NEW. Far from being as good as the Caproni?

Col. TULASNE. We believe it would be necessary to make comparative tests of both machines. We want some official tests in order to have a certain opinion about it.

Senator NEW. Is it not true that we should make all the planes we possibly can?

Mr. DE BILLY. Certainly, by all means.

Col. TULASNE. Certainly.

Lieut. MARQUISAN. Oh, no. It is better to have 1 plane of the very best type than 10 of an obsolete type.

Col. TULASNE. That is very difficult to tell, because it is a question of number. If the type is too obsolete it is of no use, but if it is just a little different it is good to have a great many of these planes. I can not give an answer to this question, because I want to have the speed, etc.

Senator REED. Let me put it in another way, which I think will cover the Senator's thought. I think the Senator wants to know whether we should confine ourselves absolutely to a certain type of bombing plane or whether we should have, perhaps, several approved up-to-date types of bombing planes. Stated in a little longer form, should we confine ourselves to the Handley-Page machine or the Caproni machine; or, in view of the fact that both of them are good machines and both of them are approved and both of them are in production, should we endeavor to utilize both of them? I am using that to illustrate and not to compare just those two particular planes, but to illustrate the whole situation, whether we should say here is one type of plane and we will have only that and one for fighting, and we will have only that, and whether if there are two, three, or four good planes, each of them really being fine machines we should not make all of them.

Col. TULASNE. That is a question of possibilities of production; but if we have to choose two planes under certain conditions it is much better to take the best of the planes; but sometimes we have difficulties of production which oblige us to have both. But if you can have just one it is better to have the best machine.

Senator REED. Is this not true, Colonel, that the Italians are making a very superior bombing machine, which is called the Caproni, and the English are making a superior bombing machine, which is called the Handley Page; is it not better for each of those nations making the planes that they are to continue to make it than to try to change it?

Col. TULASNE. Perhaps; yes.

Senator REED. If in this country we have some factories that are fitted to produce the Handley-Page and some of them to produce the Caproni, would it not be better for us to go on and make the two types of planes?

Col. TULASNE. Yes; I think so.

Senator REED. Is it true also that either of those two planes, which I think pretty nearly conform to each other in general purposes; that is, for long flights and bombing; is it not true that each of those planes may have some superiority in some respects and for certain uses over others.

Col. TULASNE. No; I do not think so. I believe that the two machines—in my opinion, one of them is better than the other, because she carries a much greater load of bombs. If I was a private individual I would buy the best of these machines, but as a Government official I believe it is best to utilize all the capacity of production.

Senator REED. You are acquainted with the Spad machine?

Col. TULASNE. Yes, sir.

Senator REED. Is that a good machine?

Col. TULASNE. That is now the best machine, a monoseater fighting machine.

Senator REED. Do you think it is the best single-seated fighting machine?

Col. TULASNE. Yes; it is.

Senator REED. Next to that as a fighting machine, what do you regard as the best?

Lieut. MARQUISAN. The S. E. 5 is very much the same and has about the same speed.

Senator REED. What is your judgment as to the Bristol fighter as made in England, and as equipped with the English engine?

Col. TULASNE. What type of Bristol?

Senator REED. The two-seated Bristol fighter.

Col. TULASNE. I believe it is a type of last year, is it not?

Senator REED. I think they are still used.

Col. TULASNE. Yes; it was built in 1917. It is that type of machine.

Senator REED. In your judgment is that a good machine?

Col. TULASNE. I believe that is a machine like the D. H. 9.

Senator REED. What do the Italians use for their light photographic machines and the machine which can also fight on the defensive?

Col. TULASNE. The SVA.

Senator REED. Is that the type of machine that fell with Gino?

Col. TULASNE. Yes. They have a single seater and a double seater. Gino fell with a single seater.

Senator REED. You two officers have been here in this country for some time studying the airplane situation, have you not—giving it particular attention?

Col. TULASNE. Yes.

Senator REED. What suggestion have you to make in reference to improvements in our airplane program so as to get results, either as applied to our machines or as applied to the whole situation?

Col. TULASNE. I believe that now your construction program of engines is very good, because you have the Liberty motor, which is a good motor, and you have other motors under construction. You have the Hispano-Suiza, which is 500 horsepower, so you have now a complete program of construction for the engines. I just suggest that to build in this country one of our best type motors, which is the Canton-Una, 500 horsepower.

Senator REED. To be used in what kind of machines?

Col. TULASNE. This Canton-Una will be used in a two-seater fighting machine.

Senator REED. What kind of results have been attained from that?

Col. TULASNE. We have not now the results of the machines. We

have just the result of the engine, because the machine and the plane is now built, but has not finished its tests.

Senator REED. Your opinion is that the Caproni machine is a better machine than the Handley-Page?

Lieut. MARQUISAN. It is just because we have seen the two machines fly, and the Caproni seems much faster and flies much better than the other, but it is necessary to make complete tests with a rigorous method before making any statement about it.

Senator REED. This new engine which you are developing, has it ever been fitted into machines and used yet?

Lieut. MARQUISAN. Yes.

Senator REED. Has it been thoroughly tried out?

Col. TULASNE. The machine is not in service. It is just being tested now. It is a two-seater fighting plane.

Senator REED. Do you not think it would be better for the French who have developed this machine to carry it beyond the experimental stage before we begin to try to make it over here?

Col. TULASNE. No; because it takes much more time to launch the production of a motor than for a plane, and it is possible to build in this country a plane a little different from the one built in France for a fighting plane for this motor. It is always possible to have a plane when you have the motor.

Mr. DE BILLY. The reason why this suggestion is made is because of what we said a while ago when the Senator questioned us about the future. It is the belief in all countries that the next year's motor will be a 500-horsepower motor, and the reason why we suggest that this motor should be tried here is that we consider that, as a motor, it is quite ready for construction.

Senator REED. We now have contracts for something in excess of 23,000 Liberty motors. Do you think we should add to the volume of those contracts and go ahead producing them as rapidly as possible?

Mr. DE BILLY. It is my very strong opinion that we should. Yes; you can never make too many of them. The Liberty motor is so much appreciated that it is asked for and demanded by the French aviation authorities and the Italian aviation authorities, as well as by the American aviation authorities. It is demanded, also, for the tanks. There is a very strong demand for the tanks.

Senator REED. They would not make the same motor for the tanks as for the air?

Col. TULASNE. I think so.

Senator REED. Would they not make it heavier?

Col. TULASNE. I do not know, exactly.

Mr. DE BILLY. There is a very strong demand, and the difficulty of your Aircraft Board now is to meet all those demands which must be for either the air or the tanks.

The CHAIRMAN. Gentlemen, I want to thank you, on behalf of the committee, for giving us some very valuable information.

(Whereupon, at 4 o'clock p. m., the subcommittee adjourned until 10.30 o'clock a. m. July 16, 1918.)

AIRCRAFT PRODUCTION.

TUESDAY, JULY 16, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 10.30 o'clock a. m., in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Frelinghuysen, and New.

STATEMENT OF COL. H. H. ARNOLD.

The CHAIRMAN. Col. Arnold, please give your full name.

Col. ARNOLD. H. H. Arnold.

The CHAIRMAN. What position do you occupy in the Aviation Service?

Col. ARNOLD. Assistant director of military aeronautics.

The CHAIRMAN. Who is the head of the Bureau of Military Aeronautics?

Col. ARNOLD. Gen. Kenly is director of the Department of Military Aeronautics.

The CHAIRMAN. How long have you been connected with the Aviation Service?

Col. ARNOLD. I started in April, 1911.

The CHAIRMAN. As a member of the Signal Corps?

Col. ARNOLD. As a member of the Signal Corps; yes, sir. My service was continuous from April, 1911, to September, 1913. I rejoined in May, 1916, and have been in it ever since.

The CHAIRMAN. Were you in that service when Langley field was equipped and the structures were placed upon it?

Col. ARNOLD. I do not quite understand your question.

The CHAIRMAN. Were you in the Signal Service at the time the present buildings and facilities for testing were placed on Langley field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. About when was that?

Col. ARNOLD. They started in the construction of Langley field as I remember it now, just about one year ago—a year ago in June.

The CHAIRMAN. When were those structures completed?

Col. ARNOLD. They are not all completed yet.

The CHAIRMAN. When was the field ready for testing?

Col. ARNOLD. We were flying down there on the field in the fall. I do not remember the exact date.

Senator REED. The fall of what year?

Col. ARNOLD. The fall of last year.

The CHAIRMAN. You say you were flying. Do you mean that cadets were being trained there?

Col. ARNOLD. They were testing and making minor experiments there last fall.

The CHAIRMAN. Was that field originally designed for the purpose of testing out and experimenting with planes?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Why was that work removed to McCook field?

Col. ARNOLD. I used to be a sit-in member of the Aircraft Board. In other words, I had the privilege of attending their meetings, and everything that I give you about Langley field is from hearsay. I heard a discussion at the Aircraft Board meeting which indicated that the reason they gave up the use of Langley field was that the transportation problem connected with Langley field was very difficult. They had one railroad line going in there and it was hard to get the machines in, get them tested, and then get them out. Another thing was that McCook field was right in the center of the manufacturing district.

The CHAIRMAN. Who comprised that board?

Col. ARNOLD. That board was comprised of Mr. Coffin, who was chairman; Gen. Squier, Col. Deeds, Col. Montgomery, Admiral Taylor, Capt. Irwin, Commander Atkins, and it had various civilians on it, the last members being Mr. Howe and Mr. Thayer.

The CHAIRMAN. Mr. B. B. Thayer?

Col. ARNOLD. I do not remember his initials.

The CHAIRMAN. When these discussions to which you have referred were going on had a field been secured at Dayton, or had the field now known as McCook field been secured?

Col. ARNOLD. The first discussion, of course, was relative to the advisability of putting this experimental work at Dayton, but as I remember it now the field at Dayton was started before the change was made.

Senator REED. I do not understand that last statement. Of course the Dayton field would have to be started before the change was made.

Col. ARNOLD. I mean this: They were actually performing experiments at Dayton before they said, "We will quit using Langley field."

Senator REED. If it was unfit for use, why didn't somebody discover that before?

Col. ARNOLD. It was all right in time of peace, when there was no big hurry.

Senator REED. But they improved it in time of war.

Col. ARNOLD. This statement was made: "It is all right in time of peace but not in time of war; we have not got time to do these things." Everything was based on this question of time and the matter of transportation.

Senator REED. There was also the question of time from other manufacturing places?

Col. ARNOLD. Yes, sir.

Senator REED. Was Langley field constructed for any one manufacturing place?

Col. ARNOLD. No, sir. It was selected by a board of officers, with a view to locating a permanent engineering laboratory there, without regard to any one manufacturer.

Senator REED. When was that located?

Col. ARNOLD. Before we got into the war. I am unable to give you the exact date.

Senator REED. How far is it from Washington?

Col. ARNOLD. About 220 miles, I should say.

The CHAIRMAN. How far is it from Newport News or Old Point Comfort?

Col. ARNOLD. From Hampton it is 5 miles; from Old Point Comfort it is about 8 miles, I should say.

Senator REED. Has it been entirely abandoned now?

Col. ARNOLD. We have an observation school, and now a small amount of experimental work is going on.

Senator REED. But it is not used for engineering and testing purposes since the transfer was made?

Col. ARNOLD. No, sir; not in a broad sense. They do conduct a few oil tests there.

Senator REED. You were talking about McCook field being located with reference to the manufacturers in and around Dayton.

The CHAIRMAN. He said they said so.

Senator REED. Yes; I know.

Col. ARNOLD. That seemed to be the general impression.

Senator REED. Were the machines tested out at Dayton, simply the ones made in Dayton or those made all over the country?

Col. ARNOLD. All machines are tested, so far as I can see, except the Capronis and the Handley Page. Those are the only two that have not been sent to Dayton for tests.

Senator REED. So that when you say they ought to be sent to Dayton with reference to the manufacturers it means that machines manufactured in New Jersey, Detroit, Buffalo, and numerous other points where planes are being made, have to be sent to Dayton and then sent back to the eastern coast if they are to be used in Europe?

Col. ARNOLD. Well, that is not altogether the case. You see, as to the original machine, each type is sent to Dayton for test. They test the machine at that place and make such improvements as they think necessary, and then they give instructions to go ahead with production.

Senator REED. Do I understand that these gentlemen claimed that there was such a dearth of transportation at a point 5 miles from Newport News that sample machines of each type could not be sent in there promptly for test?

Col. ARNOLD. That was the inference to be drawn.

Senator REED. What do you know about it?

Col. ARNOLD. Personally I think they could be tested down there.

Senator REED. Langley field is within 5 miles of Newport News?

Col. ARNOLD. About 7 miles.

Senator REED. Is it on a railroad?

Col. ARNOLD. We have a railroad running in there; yes, sir.

Senator REED. Running into Langley field?

Col. ARNOLD. We put a railroad in there ourselves.

Senator REED. You built, or the Government built, a railroad that long?

Col. ARNOLD. It is just a spur.

Senator REED. Is it a railroad of 7 miles in length or is it connected up with another railroad?

Col. ARNOLD. It is connected up with railroads that are near. We fly back and forth to Langley field all the time. It takes about two hours from Washington.

Senator REED. But you can not very well fly from here to the Dayton field?

Col. ARNOLD. We have tried to make that trip, but we have not been successful so far.

The CHAIRMAN. Were any changes made or did any suspensions occur in the work of the construction of Langley Field after this transfer?

Col. ARNOLD. They transferred all the machinery that was supposed to go from Langley Field to Dayton.

The CHAIRMAN. It was first sent to Langley Field?

Col. ARNOLD. Some of it was first sent to Langley Field, and the shipping orders were changed on other machinery so that it was shipped to Dayton.

The CHAIRMAN. What are the buildings at Langley Field used for: what have they been used for since that change was made?

Col. ARNOLD. The permanent buildings are now being completed. The temporary buildings down there, of course, were put up to cover the needs as they existed. For instance, they are doing a small amount of experimental work with oil tests and instrument tests and bomb dropping. They keep a number of machines down there all the time, but the thing has not been pushed, because it has not been necessary.

The CHAIRMAN. Because of the transfer of activities to McCook Field it has not been necessary?

Col. ARNOLD. Yes, sir.

Senator REED. How many acres in Langley Field—the flying field?

Col. ARNOLD. I should say, offhand, about 1,650 acres.

Senator REED. How much is swamp, if any?

Col. ARNOLD. I have been down there a number of times, and I have not seen any swamp.

Senator REED. Was anything said at this meeting when they were going to move to the McCook Field that they had available some swamp land that might be particularly desirable for alighting purposes, and that gave it an advantage over Langley Field?

Col. ARNOLD. No, sir; I did not hear that.

Senator REED. Have you seen McCook Field?

Col. ARNOLD. Yes, sir.

Senator REED. What is the acreage?

Col. ARNOLD. 200 acres.

Senator REED. The Wilbur Wright Field is now being transformed into a real experiment station, is it not?

Col. ARNOLD. No, sir.

Senator REED. Are they not doing experimental work at the Wilbur Wright Field?

Col. ARNOLD. In order for you to understand about the Wilbur Wright field I will have to go into the organization a little bit. At

the present time, with the dual organization, Gen. Kenly has to dictate as to the type of machines that are going to be used on the other side. Mr. Ryan produced the machines. After Mr. Ryan produces the machine Gen. Kenly tests the machine to see whether it gives the performance that must be had if it is to prove a suitable machine at the front. Gen. Kenly has to have some place where he can put the machine through its military tests, and the tests are being made at the Wilbur Wright field.

Senator REED. It is being used as an experimental station?

Col. ARNOLD. No, sir; not as an experimental station, but as a test station.

Senator REED. Perhaps I did not use the right word. What I mean is this: The Wilbur Wright field is now being used for the purpose of testing new machines along with other things?

Col. ARNOLD. Yes, sir.

Senator REED. If you had a field with 1,400 or 1,500 acres in it at which to test these machines, it could also be employed, could it not, for the purpose of training cadets? That could all be done at one field?

Col. ARNOLD. I would not say that it should be used for the training of cadets. It is a mistake, I think, to do that.

Senator REED. You have got those fields now close together?

Col. ARNOLD. We are actually training cadets and testing machines, but we do not believe in it; we think it is wrong.

Senator REED. McCook field is too small for safe testing, is it not?

Col. ARNOLD. Absolutely.

Senator REED. So that when you get down to the cold facts—and I do not mean to intimate that you have not been telling facts, but I mean that when you come to talk about it with brutal frankness—the truth is that McCook field is too small a field to be regarded as just the proper kind of a place at which to make these experiments with the new machines, is it not?

Col. ARNOLD. That would be my personal point of view.

Senator WEEKS. It is apparently because of that that you had to go a few miles farther over to the Wilbur Wright field, where there is more room, in order to test the machines?

Col. ARNOLD. There is more than that. The real reason that we took the machine away from there is that we can have it absolutely out from under the influence of the production people. We found that the tests by the production people always gave 10 miles an hour faster, or the machine climbed 100 feet per minute faster.

Senator REED. What do you mean by saying that they went faster and climbed more?

Col. ARNOLD. I mean that the records show that.

Senator REED. What is the fact about the McCook field being surrounded by trees?

Col. ARNOLD. I flew at McCook field. It is not an ideal place for flying. There is no doubt about that. It is surrounded by buildings, trees, and houses, and there is the river on one side, and then there are telephone wires. It is not an ideal field.

The CHAIRMAN. Isn't it too small, even if those objects are not present?

Col. ARNOLD. Personally I do not see why they selected such a small field.

Senator REED. Particularly it is too small for a machine that is being experimented with?

Col. ARNOLD. I would not fly an experimental machine there.

Senator REED. The Langley field has about 1,400 acres and the Wilbur Wright field has about 2,000?

Col. ARNOLD. Yes, sir.

Senator REED. And a large part of the Wilbur Wright field is swamp?

Col. ARNOLD. Some part of it.

Senator REED. There is about half that is wet or boggy or rough?

Col. ARNOLD. A good bit of it.

Senator REED. It is all liable to be overflowed?

Col. ARNOLD. The opinions differ as to that. Some people say that it is, while others say that it is not. Col. Edgar says that he has a subsoil drain which will carry off that rainfall. I know for a fact that it was under water last spring. I was out there.

Senator REED. Has he got it fixed so that it will take care of the water when the river is overflowing its banks 6 or 8 feet?

Col. ARNOLD. I do not know about that.

Senator FRELINGHUYSEN. Have you seen the result of the 36-inch rainfall?

Col. ARNOLD. When I was out there it rained for three or four days running. That was last spring. There was water all over the field.

Senator FRELINGHUYSEN. Including the floors of the hangars?

Col. ARNOLD. No, sir.

Senator REED. When was it that Col. Edgar got this drainage put in there?

Col. ARNOLD. I do not know.

Senator REED. Was it within four or five weeks?

Col. ARNOLD. We were there shortly after your committee was there—two or three days afterwards. It was not in then. I asked him about it since. As I remember it now, he said he had just put it in.

Senator REED. He has not had time to do it unless he had some thousand men at work, because it takes a good while to do that.

Col. ARNOLD. I am not sure that is going to correct it.

Senator REED. Langley Field is a dry field, is it not?

Col. ARNOLD. It was under water last winter.

Senator REED. From what cause?

Col. ARNOLD. I do not know, sir; but I remember hearing that it was under water.

Senator REED. Do you know how it is, generally speaking?

Col. ARNOLD. I have been down there four or five times and it has always been dry.

Senator REED. Do you know the reason why this field should be overflowed? Is there any reason why it can not be located upon high ground?

Col. ARNOLD. When they hunt for an aviation field they usually hunt for a flat area—a large flat area—and a very large flat area is usually low ground. I have not seen many of them on the tops of hills.

Senator REED. Within 3 miles of the Wilbur Wright field is a large, flat, elevated piece of ground without a particle of swamp on it, and the drainage runs in two or three directions from it.

Senator FRELINGHUYSEN. Are you familiar with the cost of the Wilbur Wright field?

Col. ARNOLD. I have seen the figures, but I do not remember them now. I should say, offhand, that it was over \$2,000,000.

(Col. Arnold afterwards obtained and supplied the following figure as the actual cost of Wilbur Wright field to the date of June 30, 1918: \$2,804,632.)

Senator FRELINGHUYSEN. What was the cost of grading the Wilbur Wright field? Do you recollect that?

Col. ARNOLD. I can not remember those figures; no, sir. I have seen so many figures that I get them mixed up, but Col. Edgar, who is in charge of the Supply Division, can give you the exact figures to a dollar for all the operations there.

(Col. Arnold afterwards obtained and supplied the following figure as the cost of grading at Wilbur Wright field: \$700,000.)

Senator FRELINGHUYSEN. By reason of the location of the field on this low ground the cost of preparing the field for flying was excessive, was it not?

Col. ARNOLD. It was probably more than that for any other field that we had, except Mineola.

Senator FRELINGHUYSEN. Do you know whether the advice of any of the officers of the French Aviation Service was asked in regard to the location of the field?

Col. ARNOLD. I am unable to say how the Wilbur Wright field was located. I know how pretty nearly all the other fields were located, but I am unable to say about that one.

Senator FRELINGHUYSEN. Is it not a fact that certain French officers who were here at the beginning of the war advised the Government officials that the field was not suitable for flying?

Col. ARNOLD. I can not answer that question.

Senator NEW. There are a few questions that I would like to ask.

Senator REED. Just a moment, if you please. Colonel, will you please supply us with those figures, the comparative figures for each of the flying fields in the country? We would like somewhat in detail the cost of the buildings, the ground, and the grading, including the improvements to the land. If you have had to build lines of transportation, also include that.

(The matter referred to was subsequently submitted by Col. Arnold and is here printed in full, as follows:)

Field.	Location.	Acreage.	Cost of buildings and facilities.	Yearly rental.	Grading and clearing.	Crop damage.	Railroad ltnes.	Construction started.	Field opened.
Barron.....	Everman, Tex.....	633	\$1,013,200.00	\$4,431.00	\$23,100.00	.....	\$12,000.00	Aug. 29, 1917	Nov. 15, 1917
Brooks.....	San Antonio.....	874.7	786,772.00	8,076.00	107,352.00	\$300.00	15,385.00	Dec. 12, 1917	Mar. 15, 1918
Call.....	Wichita Falls.....	640	951,500.00	1,280.00	12,000.00	.....	.....	Sept. 5, 1917	Dec. 1, 1917
Carlstrom.....	Arcadia, Fla.....	640	694,000.00	320.00	78,000.00	.....	.....	Dec. 14, 1917	Mar. 25, 1918
Carruthers.....	Benbrook.....	640	843,000.00	4,480.00	28,000.00	.....	22,000.00	Sept. 17, 1917	Nov. 20, 1917
Chanute.....	Rantoul.....	640	923,512.00	12,800.00	123,820.00	41,620.00	8,387.00	May 28, 1917	July 2, 1917
Dorr.....	Arcadia, Fla.....	640	735,000.00	320.00	76,000.00	.....	106,000.00	Jan. 7, 1918	May 23, 1918
Eberts.....	Lonoke.....	960	1,173,000.00	1.00	150,000.00	.....	100,000.00	Dec. 10, 1917	Mar. 23, 1918
Ellington.....	Houston.....	1,280	1,400,000.00	3,840.00	35,000.00	.....	8,988.00	Sept. 14, 1917	Dec. 1, 1917
Gerstner.....	Lake Charles.....	1,304.2	2,122,436.00	1,304.20	37,542.00	.....	.....	Sept. 16, 1917	Nov. 20, 1917
Hazelhurst.....	Mineola.....	1,065.88	4,241,000.00	19,500.00	345,000.00	.....	14,000.00	July 20, 1917	June 7, 1918
Kelly No. 2.....	San Antonio.....	1,721.54	8,557,200.00	24,102.00	47,580.00	8,444.05	40,000.00	July 22, 1917	Aug. 11, 1917
Langley.....	Hampton.....	1,650	750,000.00	.....	2489,201.51	.....	.....	Aug. 1, 1917	May 20, 1918
Love.....	Dallas.....	650	920,000.00	4,560.00	50,000.00	3,780.00	.....	Sept. 4, 1917	Dec. 10, 1917
March.....	Riverside.....	960	591,872.00	1.00	86,144.00	.....	.....	Mar. 15, 1918	June 15, 1918
Mather.....	Sacramento.....	1,107	509,000.00	1.00	81,000.00	.....	.....	Mar. 28, 1918	June 24, 1918
Park.....	Millington.....	907.61	1,007,261.00	9,076.10	894,994.00	28,887.45	7,649.00	Aug. 28, 1917	Dec. 3, 1917
Payne.....	West Point, Miss.....	800	650,000.00	6,400.00	160,000.00	.....	.....	Mar. 1, 1918	May 16, 1918
Post.....	Fort Sill, Government land.....	.....	1,734,983.00	.....	141,984.60	.....	81,558.00	Aug. 4, 1917	Sept. 2, 1917
Rich.....	Waco.....	690	735,000.00	6,900.00	164,812.00	.....	.....	Sept. 5, 1917	Dec. 1, 1917
Rockwell.....	San Diego.....	.....	635,969.00	.....	10,798.00	.....	25,798.00	Feb. 4, 1918	May 1, 1918
Scott.....	Belleville.....	640	1,321,880.00	7,410.52	256,000.00	33,881.00	10,640.00	June 25, 1917	Sept. 5, 1917
Selfridge.....	Mount Clemens.....	640	1,560,456.00	13,500.00	369,482.00	.....	110,209.00	May 28, 1917	July 8, 1917
Souther.....	Americus.....	800	560,810.00	8,000.00	244,029.00	.....	12,000.00	Feb. 19, 1918	May 3, 1918
Tallafarro.....	Fort Worth.....	688.8	1,061,600.00	4,132.80	25,100.00	.....	6,500.00	Aug. 27, 1917	Oct. 10, 1917
Taylor.....	Montgomery.....	800	839,435.00	3,200.00	159,900.00	4,676.00	.....	Dec. 18, 1917	Mar. 15, 1918
Wilbur-Wright.....	Fairfield.....	2,245.2	1,929,632.00	20,000.00	700,000.00	73,000.00	175,000.00	May 29, 1917	July 8, 1917

¹ Flying operations conducted at these fields prior to present construction and this date of opening.
² Includes also cost of roads, sewers, etc.

Senator NEW. Col. Arnold, I understood you to say that you had been in the aviation department of the Army since 1911.

Col. ARNOLD. Yes, sir.

Senator NEW. Since then what positions have you occupied?

Col. ARNOLD. In 1911 I learned to fly at Dayton, Ohio. I came to Washington and, in addition to my flying, I was made supply officer at the school which was then at College Park. I was supply officer from the year 1911 to 1912. In the fall of 1912 I was put in the office of the Chief Signal Officer, as assistant to the officer in charge of aeronautics. I held that office until the year 1913, when I went back to join my regiment. In May, 1916, I rejoined at San Diego as a flying officer and as supply officer. I held that position until February, 1917, when I went to Panama and commanded the Seventh Aero Squadron. I remained in Panama until the war broke out. I came to Washington after the war broke out and was in charge of the information section of the aeronautical service. I was then made assistant to the executive officer, and then later was made executive officer of the Aero Service. I was then relieved from duty as executive officer and put on the control board of the Aero Service, and then, during the recent organization, I was made assistant to the Director of Military Aeronautics.

Senator NEW. You have not been in Europe since we entered this war?

Col. ARNOLD. No, sir; I have not.

Senator NEW. Have you at any time had anything to do with the designing of aeroplanes?

Col. ARNOLD. No, sir; I have not.

Senator NEW. You are a practical flyer?

Col. ARNOLD. Yes, sir.

Senator NEW. But you are not an engineer?

Col. ARNOLD. No, sir; I am not.

Senator NEW. As a practical flyer, have you made any recommendations to the department concerning the types of aeroplanes that should be adopted for use by this country?

Col. ARNOLD. I am a member of the Joint Army and Navy Technical Board, which recommends all the machines before they are put into production. That was before this recent split. Since this split, the Joint Army and Navy Technical Board has practically ceased to exist.

Senator REED. What do you mean by "split"?

Col. ARNOLD. Since the reorganization, when they separated production from operation.

Senator NEW. Have we completed any aeroplanes in this country for service at the front?

Col. ARNOLD. We have one type that we are sending over for service on the front that was a copy of a British design, changed to take care of the Liberty engine.

Senator REED. What is that?

Col. ARNOLD. The D. H. 4.

Senator NEW. Your answer to that question is qualified. That seems to be a qualified answer, Colonel. I wish you would explain just what you meant by that.

Col. ARNOLD. Your question is subject to two interpretations: One is, Have we designed and built any planes for service on the front? The other one is, Have we merely constructed planes, regardless of who designed them?

Senator NEW. Well, separate the question.

Col. ARNOLD. We have not designed and constructed any planes for service on the front. We have copied an English design and built the planes and sent them over.

Senator NEW. And that design is the De Haviland 4?

Col. ARNOLD. Yes, sir.

Senator REED. Modified to fit the Liberty engine?

Col. ARNOLD. Yes; modified for the Liberty engine.

Senator NEW. Have we adopted any other type and attempted its construction?

Col. ARNOLD. We attempted to revise the Bristol for construction in this country, to be sent over for service.

Senator NEW. What was the Bristol?

Col. ARNOLD. It was an English two-seater plane of comparatively good performance used on the front as an observation and fighting machine.

Senator NEW. Designed for use with what kind of a motor?

Col. ARNOLD. Two types of engines. One is the 190-horsepower Rolls and the other is the 200-horsepower Hispano Suiza.

Senator NEW. Can you give us the comparative or approximate weight of those engines?

Col. ARNOLD. The Rolls 190-horsepower engine weighs 710 pounds; the Hispano weighs 515 pounds.

Senator NEW. What is the weight of the Liberty motor?

Col. ARNOLD. The Liberty engine weighs 800 pounds.

Senator NEW. Eight hundred and twenty-four, is it not?

Col. ARNOLD. It varies from 800 to 810, depending upon the particular engine.

Senator NEW. We have sent abroad some of the De Haviland 4's, have we not?

Col. ARNOLD. Yes, sir.

Senator NEW. Have you any knowledge as to how many of them have been put into service on the front?

Col. ARNOLD. We have not received any report relative to that, sir.

Senator NEW. You have not?

Col. ARNOLD. No, sir.

Senator REED. How many did we send and when were they sent? Can you give us that information?

Col. ARNOLD. I told my secretary to put that data in here, but he neglected to do it, apparently. There had been approximately 400 shipped up to last week.

(Col. Arnold later secured and supplied the information that the number of De Haviland-4 planes which had been forwarded for shipment overseas to the date of July 12 was 425.)

Senator NEW. You said, I believe, Colonel, that you had no means of knowing just how many of these American-built De Haviland-4's had been received on the front in France?

Col. ARNOLD. No, sir; we have not.

Senator NEW. The War Department has no report on that subject?

Col. ARNOLD. We get a monthly report from the other side showing the number of planes that they have on the front of every type. It has only been a very short time since they started shipping these De Haviland machines overseas. The planes that they shipped over were not ready to be immediately put on the front. There were certain minor changes that had to be made to make them serviceable.

Meanwhile we did get reports showing the number of planes they had on the front and giving the names of the different types of planes. The last report I saw gave the names of the planes in use. It showed the Nieuport, the Spad, the AR-2, the Sopwith, the Sampson, and the Voisin, none of which are American-made planes.

Senator NEW. Will you let us know—or state for the record—just how many of those planes there were? Give us the figures that are contained in that report you have just read and the date.

Col. ARNOLD. The date of the report that I just read was April 30, but I have a later one than that.

Senator NEW. Let us have the later one.

Col. ARNOLD. I did not know exactly the questions you were going to ask or I could have brought the information along with me. I have not got that with me.

Senator NEW. May I ask you, then, to supply those figures when this transcript is sent you for correction?

Col. ARNOLD. Yes, sir; I will put them in. I will put in the number of each one of these types where I have given the name.

Senator NEW. State in each case whether or not it is an American or foreign built machine.

Col. ARNOLD. Yes, sir.

(The matter referred to was subsequently submitted and is here printed in full, as follows:)

Actual deliveries of aeroplanes from contracts placed with France, with types.

Type.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Service, artillery:								
A. R. 1.....					1			1
A. R. 2 (Ren. 190).....			16	4		12	19	51
Salmson (Salm. 270).....					15	12	46	73
Sopwith A2 (Rh. 120).....			10	17	39	21	113	200
Sopwith B2.....						14	31	45
Fighters:								
One-seater—								
Morane Saulnier Rouleur (Gnome-Anzani Rhone 50).....	14	36	9	5	44			108
Nieuport XXVIII (Gnome 160).....				37	21	102	20	180
Spad VII (H. S. 150).....	1	1				18	28	48
Spad XIII (H. S. 220).....	2						24	26
Two-seater—								
Spad XI A2 (H. S. 200).....			2	8		12		22
Bombers:								
Day—								
Breguet 14A2.....							14	14
Breguet 14E2.....							7	7
Breguet 14B2 (Fiat 300).....	2	13	8	14				37
Sopwith B2 (Cl. 130).....				18	15			33
Night, short range—								
Voisin (Peugeot 220).....					8			8
Training.								
Caudron G3 (Rh. 80).....	1				18	14	24	57
Farman (Ren. 130) F40.....			6	2				8
Farman 50 B2 (Ren. 130).....				2				2
Nieuport X (Rh. 80), same as 83.....	43		2			68		113
Nieuport XIII (Rh. 80), same as LXXXI.....	15		16	36	9			76
Nieuport LXXX (Rh. 80).....						20	30	50
Nieuport LXXXI (Rh. 80).....						15	17	32
Nieuport XIII, S. C. (Rh. 80), same as LXXX.....	16		6	16	36			74
Nieuport XVII (Rh. 120).....	74	1						75
Nieuport XXI (Rh. 80).....	118	23	15	12	9			177
Nieuport XXI (Rh. 120).....		1	3					4
Nieuport XXIII (Rh. 80).....			1					1
Nieuport XXIII (Rh. 120).....			16	13				29
Nieuport XXIV (Rh. 120).....		41	32	10	1			84
Nieuport XXIVbis (Rh. 120).....	2	9	43	33	1	2		90
Nieuport XXVII (Rh. 80).....		20	48					68
Nieuport XXVII (Rh. 120).....	111	65	1	1				178
Nieuport LXXXIII (Rh. 80).....			35		4		47	86
Total.....	399	210	269	228	221	310	420	2,057

Actual deliveries of aeroplanes from contracts placed with Great Britain: Sopwith Camel (Clerget 130), 13.

Actual deliveries of aeroplanes from contracts placed with Italy, S. I. A. (D. C.), 44.

Grand total, 2,114.

Senator New. Then I would like you to give us the reports as to the number of machines that had been delivered and put in use by Gen. Pershing's forces on the 1st of June, and also on the 1st of July, if you please.

Col. ARNOLD. The number of American-built planes?

Senator New. The number of American-built combat planes that had been put in use on the front on the 1st of June and the 1st of July, or if it is impossible to supply the figures as of those dates, approximate those dates just as nearly as you can, using the reports nearest to those dates.

Col. ARNOLD. I would have to cable for the dates. I can get the June 1 report, but I would have to cable for the last date.

Senator New. Then I suggest that you do that.

(Col. Arnold afterwards supplied the information that no planes of American manufacture had been delivered at the front on June 1, but that by July 1 about 200 had been delivered. While exact information on this subject was not at hand, latest advices were that little or no use had been made of these planes at the front up to July 1.)

Senator New. In answering a previous question, which you did somewhat in detail, you said that when those planes (referring to the De Haviland) were received over there they were not in condition for immediate use.

Col. ARNOLD. Yes; I said that.

Senator New. What do you mean by that?

Col. ARNOLD. In the first place the machine has no altitude control device. I do not know exactly what changes the American people, or our forces, are making in the machines, but the English are putting on a different carbureter.

The CHAIRMAN. We were told yesterday by Col. Tulasne that they get excellent results by moving the carbureter from its position as we put it in the engine.

Col. ARNOLD. Yes. Col. Tulasne told me about that several weeks ago. I immediately asked our production people why we did not do the same thing, and I was told that they were considering it. I understood Col. Tulasne to say that he got 20 more horsepower by making that change.

The CHAIRMAN. Thirty more.

Col. ARNOLD. Then they have improved it since I spoke to him.

Senator New. Is the matter of altitude control an important one?

Col. ARNOLD. It is important in this way, that due to the fact that we have not got altitude control the engine burns 36 gallons of gasoline an hour. By putting altitude control in, you get it down to 23 gallons an hour, and you get a radius of action that is greater. At the present time the radius of action is only two hours, which is very small for any machine that is used on the front.

Senator New. Now, what other deficiencies were there that have come to your notice?

Col. ARNOLD. The cloth is one thing; that gets loose after about 20 hours of flying. It has to be entirely resurfaced.

Senator NEW. Does the loosening of the cloth impair the efficiency of the machine?

Col. ARNOLD. If it is not changed, the cloth will come off in the air, as it did with the Bristol, and there will be a fatal accident.

Senator NEW. In other words, it renders the machine highly dangerous?

Col. ARNOLD. Yes, sir.

Senator NEW. What is the cause of that loosening?

Col. ARNOLD. I am not, as I have said before, a technical man, but I inquired into these things. The first thing I asked of Col. Semple, the British technical expert, was why the cloth was not applied properly and not doped properly. He said that as a matter of fact there is nothing wrong about the cloth, but it must be put on properly.

Senator FRELINGHUYSEN. In other words, it is due to poor workmanship?

Col. ARNOLD. I would not say that, because the workmen do what they are told. It is improper designing.

Senator NEW. And improper inspection?

Col. ARNOLD. Yes.

Senator FRELINGHUYSEN. Has this happened to the De Haviland 4's?

Col. ARNOLD. Yes, sir. We have at Mineola eight De Haviland 4's. We took them out to find out what was the matter. Out of the eight we flew five, and they all have loose cloth. They were all made at Dayton, at the Dayton-Wright plant.

Senator NEW. All those machines, then, are dangerous?

Col. ARNOLD. They are not so dangerous that we will not fly them now, but as the cloth gets looser they become so dangerous that they will not fly them. In other words, after 20 hours' flying they have to change the cloth.

Senator FRELINGHUYSEN. They had the same trouble with the Bristol fighter?

Col. ARNOLD. Yes, sir.

Senator NEW. Would you say that you regard the De Haviland plane as it is produced to-day as an efficient and satisfactory machine?

Col. ARNOLD. No, sir; it is not a satisfactory machine.

Senator REED. That is, the De Haviland 4 and the Bristol fighter?

Col. ARNOLD. As they are being produced.

The CHAIRMAN. Before we leave the question of the De Haviland plane I want to ask if these defects and deficiencies to which you have referred developed in the tests of the machine after it was sent over?

Col. ARNOLD. We developed them in our own tests.

The CHAIRMAN. Did you find anything wrong with the compass?

Col. ARNOLD. The compass was worthless.

The CHAIRMAN. Why?

Col. ARNOLD. Our production people improved on it to such an extent that they made it worthless.

The CHAIRMAN. Please explain what that improvement consisted of.

Col. ARNOLD. The English, in their mountings, have agate in order to reduce the friction of the rotating member.

Senator NEW. It is a nonconductor, in other words.

Col. ARNOLD. We improved it by putting steel on the agate. Now it is worthless.

Senator REED. It is worthless, you say?

Col. ARNOLD. That is the report on it that we get, that it is worthless.

The CHAIRMAN. When was that improvement made?

Col. ARNOLD. I do not know.

The CHAIRMAN. About when was that made?

Col. ARNOLD. Well, I can not answer that question, because the first I knew about our improvement of the compass was that it was put on a machine and immediately the testing squadron reported that it was worthless.

The CHAIRMAN. What department or division has charge of the supply of compasses?

Col. ARNOLD. The equipment division.

The CHAIRMAN. Can you give the name of the official or individual having direct charge of such equipment as compasses?

Col. ARNOLD. I can not answer that question, because I am not acquainted with the intimate details of that organization. Col. Deeds was in charge of the equipment division, and later, Montgomery.

The CHAIRMAN. Do you know in what volume the improved compass has been manufactured?

Col. ARNOLD. I had those figures all prepared to bring along, but through some mistake my secretary did not put them in my bag.

The CHAIRMAN. Can you furnish them later?

Col. ARNOLD. Yes, sir.

(Col. Arnold later supplied the information that a total of 1,154 of these compasses were on order, of which 442 had been delivered.)

The CHAIRMAN. You were about to refer to a report concerning the compass test when I interrupted you with a question. I wish you would turn to that report and say what it is.

Col. ARNOLD. Here is a report that we submitted. The compass is useless.

The CHAIRMAN. What is the date?

Col. ARNOLD. May 12, 1918. It says that the compass is useless due to rotation; that they will be reswung or replaced; that it is thought best not to hold up the shipments, but allow them to install better compasses.

The CHAIRMAN. That is a report to Gen. Pershing?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. What other defects were developed at the tests, either in France or at Mineola, or elsewhere, in the De Haviland fighting machine?

Col. ARNOLD. There are no other defects that I can think of, except small defects that can be easily corrected.

The CHAIRMAN. Why were not those defects which you spoke of developed at the McCook Field?

Col. ARNOLD. I can not answer that question. I saw the first machine that was flown there. I saw it fly myself, in December, 1917. There was no military test given the machine until we got the machine ourselves. That was in April, 1918. I believe it was April 15.

Senator REED. Who was in charge of McCook Field at that time?

Col. ARNOLD. Col. Clark and Col. Vincent.

Senator REED. Which one of them would have charge of the testing of this machine?

Col. ARNOLD. This machine was not at McCook Field. This machine was at the Dayton-Wright Field, commonly called the South Field.

Senator REED. Who had charge there for the Government—anybody?

Col. ARNOLD. I do not know the intimate details connected with that organization, sir. I can not answer that question.

The CHAIRMAN. You can not answer?

Col. ARNOLD. No.

Senator NEW. I want to try to make one point clear. Whatever test was made there at the Dayton-Wright Field was not made by the Government nor under the supervision of Government officials?

Col. ARNOLD. In a general way; yes. I remember seeing this machine fly in December. A civilian went up and flew it, and when he got through they said, "What a wonderful machine." Col. Jones, who wanted to fly that machine, was not permitted to fly it.

The CHAIRMAN. What was the reason given for that?

Col. ARNOLD. Because he had not flown that particular type of machine.

Senator NEW. Is that B. Q. Jones?

Col. ARNOLD. Yes; and he probably knows more about flying machines than any other man they ever had.

The CHAIRMAN. When you get these machines for practical tests of your own at Wilbur Wright Field and such other places as you make them, do you aim to make the tests with what is called a military load?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Are they flown at McCook Field with a military load?

Col. ARNOLD. I do not think so.

The CHAIRMAN. Is the test without a military load a satisfactory one?

Col. ARNOLD. I do not think they are satisfactory, because they always get a higher performance than we do.

Senator REED. That is, they report a higher performance?

Col. ARNOLD. Yes.

The CHAIRMAN. How early, Col. Arnold, did your branch of the service attempt to secure the facts regarding the De Haviland and the merits of the planes from the production department?

Col. ARNOLD. As soon as we saw this machine we began to ask questions. We asked, "How fast will it go?"

The CHAIRMAN. That was in December.

Col. ARNOLD. In December; yes.

The CHAIRMAN. Whom did you ask?

Col. ARNOLD. We asked the production people. They said they were going to have tests. We were always told that they were going to have them.

The CHAIRMAN. Who was in charge?

Col. ARNOLD. Col. Deeds and Col. Montgomery. They were always going to have tests. Finally, I was at Dayton, again, in February, and the test had not been pulled off then. I was getting sort of dis-

couraged because these machines were coming out in quantity, and we did not know what they would do. I came back to Washington and asked point-blank that the machine be put through a test, and asked if they would not test it, to give us a machine so that we could test it ourselves.

Senator REED. When was that?

Col. ARNOLD. March.

The CHAIRMAN. How long a time elapsed between your first effort to secure the facts regarding the De Haviland and the time when you were able to obtain them?

Col. ARNOLD. I can not remember when we first started asking for tests of the machine, whether it was in the latter part of December or the first part of January, but it was some time in those months. We did not have the machine turned over until the 15th of April.

The CHAIRMAN. When did you make the first test?

Col. ARNOLD. April 15.

The CHAIRMAN. So that you had spent about two months' time?

Col. ARNOLD. Yes. It was more than that. It was January, February, March and April.

The CHAIRMAN. Did you get any statements or records as to the results of the tests made at the Dayton-Wright field before the 8th of May?

Col. ARNOLD. Only that somebody said the machine made 130 miles an hour.

The CHAIRMAN. I mean an official report.

Col. ARNOLD. No, sir.

The CHAIRMAN. Did you get one about the 8th of May?

Col. ARNOLD. It seems to me they turned over a machine to us to test, and McCook Field also started in to test.

The CHAIRMAN. In other words, simultaneously with giving you a machine to test one was turned over to McCook Field to test?

Col. ARNOLD. Yes; that is approximately right.

The CHAIRMAN. Did you get records of the tests from the McCook Field?

Col. ARNOLD. We sent Col. Bane there. There had been several deaths. Maj. Damm and Maj. Brindley were both killed. We saw that we had to do something.

Senator REED. Killed in these machines?

Col. ARNOLD. In the De Haviland; yes. We sent Col. Bane to conduct the tests himself.

Senator REED. At McCook Field or the Wilbur Wright Field?

Col. ARNOLD. At the Wilbur Wright Field. Col. Vincent at that time was starting to test his machine. Col. Bane had his machine at the Wilbur Wright Field. They always differed as to speed by about 10 miles. The McCook Field test was always about 10 miles faster than the Wilbur Wright Field test.

The CHAIRMAN. We have a record of a test made on the Wilbur Wright Field.

Col. ARNOLD. Yes.

The CHAIRMAN. Now, about what was the date of that?

Col. ARNOLD. About May 9.

Senator NEW. Col. Arnold, have you had any reports from Gen. Pershing as to the efficiency of the De Haviland four machines delivered to him?

Col. ARNOLD. A cablegram came back about it, sir.

Senator NEW. What was the nature of that cablegram?

Col. ARNOLD. It had about three or four pages of criticism of structural defects of the machines. Most of them were minor ones that we knew about. We knew most of them before the machines were sent over.

Senator NEW. I would like to have that cablegram in the record.

(Informal discussion followed.)

Senator NEW. I move, Mr. Chairman, that the chairman be requested to again request from the War Department a copy of the cablegram from Gen. Pershing, the date of which I do not definitely know, but in which there was enumerated a number of defects in the De Haviland 4 plane, and with it such other cables from the same source as have a direct bearing on this question.

Senator FRELINGHUYSEN. My position is this, that before this report is written the information concerning the airplanes that we have sent to Europe, which information has been cabled by Gen. Pershing, must be revealed to this committee, and if the War Department refuses to allow us to look at these cablegrams I feel that our report should so state. It should state that this information has been concealed from us, so that the country may know that the War Department has prevented us from being fully informed upon this subject. That is my position in this matter.

(Informal discussion followed.)

Senator REED (addressing the witness). Do you know when that cablegram came?

Col. ARNOLD. No.

Senator REED. Can you give the date approximately?

Col. ARNOLD. I should say the latter part of June.

Senator REED. I move to amend the motion of Senator New, and ask that it be made to read this way:

That the Secretary of War be requested to furnish the committee a copy of the cablegram sent by Gen. Pershing in the latter part of June or the early part of July, in which he pointed out the conditions and the performances of the De Haviland 4 machine.

Senator NEW. I will accept that.

The CHAIRMAN. Gentlemen, you have heard the motion.

Senator FRELINGHUYSEN. I move to amend that, and ask that the committee be allowed to see all of the cables relating to what Gen. Pershing has said relative to aviation.

[Informal discussion occurred.]

Senator FRELINGHUYSEN. I would like to ask whether these aviation cables are kept in separate files. Are they in bulk or are they pasted in a book?

Col. ARNOLD. We get approximately 30 cables a day relating to aviation and we send out approximately the same number.

[Informal discussion occurred.]

Senator FRELINGHUYSEN. I will withdraw my motion. I feel very deeply that this committee should make a searching investigation.

The CHAIRMAN. You have heard the motion of Senator Reed.

[The motion was agreed to.]

Senator NEW. Is it not true that the general tenor of the cable received from Gen. Pershing on or about the 28th of June—you know

the cablegram to which I refer—was that the De Haviland machine as delivered to him was not satisfactory?

Col. ARNOLD. Before I answer that question I will say that if you take the mere fact that he sent the cablegrams in which he criticized the construction of the machine as being an indication that it was not satisfactory, I answer your question yes; it was not satisfactory.

The CHAIRMAN. Let me ask you if you feel any reluctance about answering these questions because of your position as a military officer under the command of a higher official? In other words, is there anything in your official position which makes you feel reluctant about answering?

Col. ARNOLD. It makes me hesitate.

Senator NEW. I wish to say that I do not want to embarrass you. I do not want to ask you a question which it embarrasses you to answer.

Col. ARNOLD. I personally would prefer that you wait until you can see whether you get the cable. If you get the cable, that will answer your question.

Senator NEW. We have shipped no planes abroad other than De Haviland's, have we?

Col. ARNOLD. No, sir.

Senator NEW. It has been reported unofficially to this committee that the first De Haviland machine which was sent abroad, late in February, went abroad without any tests having been made of it. Do you know whether or not that is true?

Col. ARNOLD. I can not say for a fact whether it is true, but the probabilities are that it is true. That machine, I think, never reached France.

The CHAIRMAN. Never reached France?

Col. ARNOLD. No, sir; I think it was sunk by submarines.

The CHAIRMAN. That was the first machine forwarded?

Col. ARNOLD. I think so. As I remember it now, we got a telegram—

Senator NEW. Haven't shipments of De Haviland machines been held up since the Pershing cablegram was received?

Col. ARNOLD. No, sir.

Senator NEW. They are still being sent?

Col. ARNOLD. Yes, sir.

Senator NEW. Are they being more rigidly tested in this country than they were before that cablegram was received?

Col. ARNOLD. After aviation was separated from the Signal Corps. Gen. Kenly took it upon himself to prescribe that all machines should be given a flying test before they were shipped overseas.

Senator NEW. Tested by whom?

Col. ARNOLD. By Army aviators. This was not carried out, however. We could not get the pilots, in the first place. We could not get the factories to do it, so then we turned it over to one of our men and made him responsible for seeing that all received a flying test before they were packed for overseas shipment.

Senator NEW. Who is that officer?

Col. ARNOLD. Col. Bane.

Senator NEW. Now, I want to take up another subject.

The CHAIRMAN. Is this other subject one relative to De Haviland planes?

Senator NEW. Not at all.

Senator FRELINGHUYSEN. You spoke of the defects in the De Haviland 4 being the loosening of the cloth owing to imperfect construction?

Col. ARNOLD. Yes.

Senator FRELINGHUYSEN. And imperfect workmanship?

Col. ARNOLD. Yes, sir.

Senator FRELINGHUYSEN. Have you had any similar experience with any of the training planes?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. The training planes manufactured by Curtiss did not develop this defect, did they?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. Did the training planes manufactured by the Fisher Body Corporation?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. By the Dayton Wright Co.?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. By the Standard Airplane Co.?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. Do you believe that if those factories were under Government control these defects would occur?

Col. ARNOLD. Yes, sir.

Senator FRELINGHUYSEN. Why?

Col. ARNOLD. It is not the fault of workmanship; it is the fault of design. If you do not tell them the proper way to put on the cloth, naturally they put it on wrong.

Senator FRELINGHUYSEN. Who was responsible for the imperfections in design?

Col. ARNOLD. I can not answer that question, sir. As I testified before, I talked to Col. Semple, who is the latest arrival on this side. He has the latest information from the other side. He tells me that instead of putting the cloth on perpendicularly to the leading edge they put it on diagonally to the leading edge. They dope it in an entirely different way and they fasten it to the ribs in an entirely different way.

Senator FRELINGHUYSEN. Has that defect been remedied in any particular?

Col. ARNOLD. So far as I know, no, sir. The production people state that the original De Haviland 4 machine that they received from England had the cloth put on in exactly the same way that they are putting it on now. In any event, it is not satisfactory.

Senator FRELINGHUYSEN. Then there is a conflict of opinion between the Department of Military Aeronautics and the Aircraft Production Division on this question?

Col. ARNOLD. I do not think there is any conflict of opinion. I think that they agree as to that.

Senator FRELINGHUYSEN. Why were these defects not remedied?

Col. ARNOLD. I can not answer that question, sir.

Senator FRELINGHUYSEN. Is the De Haviland 4, as designed in this country, a proper design for the Liberty engine, in your opinion?

Col. ARNOLD. I think it makes a very good machine, providing they do not put what we call too many Christmas-tree ornaments on it. As a design for a day bomber, it is an excellent machine, but unfortunately it is the only machine that is being produced, so that we have to use it for a day bomber, an observation machine, and a two-seater fighter. It is not suitable for a two-seater fighter, because it is not handy in the air. As a day bomber it is not entirely satisfactory, due to the short radius of action and the low ceiling; and the same objection applies with regard to its use as an observation machine. But it is a fairly good machine with certain structural modifications.

Senator FRELINGHUYSEN. Then, we have had a mistaken policy in not constructing engines of other types suitable for fast flying machines, relying entirely on the Liberty engine; is that true?

Col. ARNOLD. I think that is true; yes, sir.

The CHAIRMAN. Did you, as one of the members of the Signal Corps, acting for the Signal Corps, make any effort to get from the Production Board any records as to the speed of the Bristol machine at any time?

Col. ARNOLD. We saw the first Bristol flight, some time between the latter part of February and the first week of March. I think it was about March 5. Beginning that day we tried to get the performance of that machine. We wanted to know what we could expect from it.

The CHAIRMAN. With what success?

Col. ARNOLD. We never did have a complete military test of that machine.

The CHAIRMAN. From whom did you try to get this record?

Col. ARNOLD. From the Equipment Division.

The CHAIRMAN. Who was at the head of it at that time?

Col. ARNOLD. I think Col. Montgomery was for a while, and then Mr. Potter.

The CHAIRMAN. You were going to turn to the record, I believe.

Col. ARNOLD. Yes. My records show here that the first actual flying test we had of the Bristol was about May 9, on which date we got a speed test for the Bristol.

The CHAIRMAN. Was that date the first time that you were able to get this test?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. When you did get it Mr. Potter was in charge of production?

Col. ARNOLD. Yes, sir; Mr. Potter was in charge of production. That was with the Liberty engine in it.

The CHAIRMAN. Were those records furnished to the Army and Navy joint board?

Col. ARNOLD. They were never completed.

The CHAIRMAN. To the extent that they were completed, were they furnished to the Army and Navy joint board?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Now, upon what basis were those records made? You say that they were not complete.

Col. ARNOLD. The tests were not complete. In other words, these were just tests made by the production people. They took a speed test. The climbing test was never completed and the endurance test

was never completed. The real reason was that the cloth failed on the Bristol and it was demolished.

The CHAIRMAN. Who made the records originally?

Col. ARNOLD. Col. Bayne was at Dayton, but Col. Hall was conducting the tests.

The CHAIRMAN. Did you get records made by Mueller, the engineer of the Curtiss plant?

Col. ARNOLD. He gave us a different kind of record. The joint board wanted to pass on the suitability of the Bristol machine with the Liberty engine in it. They requested the production division to furnish a stress analysis and estimated performances. After waiting for several weeks we got a report, submitted by the chief engineer of the Curtiss Co., Mr. Mueller, without any notation of the production engineers, as to whether they approved or disapproved or anything else. We sent it back to the production people, asking what their engineers thought about it.

The CHAIRMAN. Did you get any reply?

Col. ARNOLD. No, sir; we have not got any reply.

The CHAIRMAN. You have no reply? Were those records which Mueller furnished you from actual flying tests or were they his estimates?

Col. ARNOLD. Estimates, sir.

The CHAIRMAN. Were they submitted, or were any of the records submitted, to Col. Vincent?

Col. ARNOLD. I think that Col. Vincent got them from Mueller and furnished them to us.

The CHAIRMAN. They went through Vincent to you?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Is he what is called an aeronautical engineer?

Col. ARNOLD. No, sir; he is not; he is a mechanical engineer.

The CHAIRMAN. He is in charge of the McCook field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. And has been since Clark left?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. A very recent and additional test was made of the Bristol, was there not?

Col. ARNOLD. We had the Bristol, with a 300 Hispano turned over to us out at McCook Field. Realizing that it was not altogether satisfactory with the Liberty engine in it, we wanted to see if we could use it with the 300-horsepower Hispano. We had some tests made of it. The McCook Field people made the first test and then we made a test.

The CHAIRMAN. When did they make their test?

Col. ARNOLD. About May 22. Then it was turned over to us for test about July 1.

The CHAIRMAN. Have you tested it?

Col. ARNOLD. Yes, sir. We tested it at the Wilbur Wright Field.

The CHAIRMAN. What was the result of the test with the Hispano Suize?

Col. ARNOLD (reading):

Weight empty	-----pounds--	1,842
Military load	-----do----	1,068
Gross	-----do----	2,910
Crew	-----do----	360
Armament	-----do----	364

Fuel and oil	pounds	344
Climb in 11 minutes	feet	10,000
Climb in 21 minutes	do	15,000
Speed at ground	M/H	114.7
Speed at 6,000 feet	do	112.5
Speed at 10,000 feet	do	103.5
Ceiling (theoretical)	feet	21,000

The CHAIRMAN. What was the test at McCook Field?

Col. ARNOLD (reading):

Weight, empty	pounds	1,667
Military load	do	534
Gross	do	2,201
Crew	do	365
Armament	do	160
Fuel and oil	do	338
Climb in 10.41 minutes	feet	10,000
Climb in 19.41 minutes	do	15,000
Speed at ground		
Speed at 6,000 feet	miles per hour	126.5
Speed at 10,000 feet	do	122
Ceiling (theoretical)	feet	24,000

The CHAIRMAN. You tested it with a military load?

Col. ARNOLD. Yes, sir. They also claim they tested it with a military load.

The CHAIRMAN. With the usual difference that seemed to develop?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. What was the result of the test with regard to the Hispano-Suiza 300-horsepower engine?

Col. ARNOLD. We are not satisfied.

Senator FRELINGHUYSEN. What are you going to do about it?

Col. ARNOLD. That is not up to us. We tell them what we want.

The CHAIRMAN. In other words, you determine upon what must be produced by the Production Board to satisfy the needs of the Bureau of Aeronautics?

Col. ARNOLD. Yes; for the people on the front.

The CHAIRMAN. And then the production of the things which you have ordered or tested and which you want is up to the production side of the activities?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Does that result in misunderstanding or friction?

Col. ARNOLD. Well, we are not getting anywhere. There is no friction.

The CHAIRMAN. I used the wrong word.

Col. ARNOLD. They are perfectly willing to do everything that Gen. Kenly asks for.

The CHAIRMAN. But you say you are not getting machines.

Col. ARNOLD. Yes, sir.

The CHAIRMAN. To what do you attribute that, notwithstanding the harmony of understanding. To what do you attribute the fact that you are not getting satisfactory results?

Col. ARNOLD. My answer is the simple statement that you do not have a bricklayer make you a suit of clothes.

The CHAIRMAN. In other words, some of them are not fit for the work?

Col. ARNOLD. That is my personal opinion.

The CHAIRMAN. Some of those who have upon their shoulders the burden of production are not fitted for the task?

Col. ARNOLD. A ball-bearing expert can not cure a radiator problem; a salesman can not put guns on an airplane in the proper places; an automobile engineer can not design aeroplanes.

The CHAIRMAN. Do you mean an airplane or an engine?

Col. ARNOLD. He can not design airplanes. That is the condition that exists.

The CHAIRMAN. Are automobile engineers in the production division of aviation engaged in the attempted production of aeroplanes?

Col. ARNOLD. Col. Vincent is in charge of all production.

The CHAIRMAN. Does he attempt to design airplanes?

Col. ARNOLD. He passes on them.

The CHAIRMAN. The engine builder not only passes on engines but also on planes?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Is McCook Field the testing or experimental station for all engines and airplanes used or to be used in the Aviation Service of the United States?

Col. ARNOLD. As I understand it, all machines, before they are put into production, are sent to McCook Field to have the drawings checked up and to be given certain production tests and passed upon by the engineers at that place.

The CHAIRMAN. Does that statement apply as well to planes as to engines?

Col. ARNOLD. Yes, sir; it does.

The CHAIRMAN. Is the decision of the authorities in charge of McCook Field, either as to adoption or rejection, final?

Col. ARNOLD. No, sir; because after they start in production they have to produce a machine which is satisfactory to Gen. Kenly.

The CHAIRMAN. Is the initial step of production dependent upon the final say of those in authority at McCook Field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. So that you can not start production until they have determined that you shall?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Then, matters are still subject to this condition, that what is produced shall be satisfactory to the Bureau of Aeronautics?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Do you consider that condition beneficial or otherwise to the aviation program?

Col. ARNOLD. I do not think it is. I think it is detrimental to the progress of the aviation program.

The CHAIRMAN. Who was responsible for that condition of affairs?

Col. ARNOLD. I can not answer that question.

The CHAIRMAN. Who inaugurated the system?

Col. ARNOLD. It was started when the equipment division was run by Col. Deeds and Col. Montgomery.

The CHAIRMAN. Do you know whether or not the objectionable conditions there have been called to the attention of the present administrator of production?

Col. ARNOLD. I do not know.

The CHAIRMAN. Do you know of any instances in which the Bureau of Aeronautics have requested changes in or additions of any sort to the machines or motors; if so, please state what they are and whether these requests have been complied with.

Col. ARNOLD. Some time in the early part of June a request was submitted to the director of aircraft production that two steel braces be placed on the stabilizers of the DH-4 in order to strengthen the stabilizers.

A couple of weeks later we noticed that the machines that were coming in or that were coming out of production did not have braces upon them; and upon a further request for information from the Bureau of Aircraft Production the Director of Military Aeronautics was notified that the braces for the machines which were not fitted with them had been shipped separately to Europe, so that they could be put on after the machines arrived on the other side. So far as I know, those braces have not yet been placed on any machine that has been produced.

The CHAIRMAN. Do you consider that method a compliance with the requirements of the Bureau of Aeronautics?

Col. ARNOLD. No, sir; we do not.

The CHAIRMAN. Why?

Col. ARNOLD. Because we believe that all those braces should be fitted on the machine in the factory.

The CHAIRMAN. And tested out?

Col. ARNOLD. And the machine should be flown with them on.

The CHAIRMAN. What reply have you made to the information you have received from the production board regarding the manner in which they have attempted to comply with your request?

Col. ARNOLD. We have asked them again to see that the braces are placed on the machines.

The CHAIRMAN. How long ago was that?

Col. ARNOLD. Some time in the middle of June.

The CHAIRMAN. Do you know whether or not it is being done?

Col. ARNOLD. I have seen later De Havilands, but the last time I investigated it was not being done.

The CHAIRMAN. That was how long ago?

Col. ARNOLD. Some time toward the latter part of June or the first part of July.

Senator FRELINGHUYSEN. Are there any experienced men in this country to-day who could improve this situation in the production of aircraft?

Col. ARNOLD. The situation would be improved if you had one man at the head of all aviation.

The CHAIRMAN. You mean at the head of what?

Col. ARNOLD. Of all aviation.

The CHAIRMAN. Including the military and production side?

Col. ARNOLD. Yes; so that when the man in charge of operation told or asked the production department to do a certain thing to improve performance the man sitting at the top would say, "Do it." and if he did not do it he would be kicked out. As it stands now the man in charge tells his subordinates to do this thing; then subordinate No. 1 tells subordinate No. 2, and subordinate No. 2 tells sub-

ordinate No. 3, and so on; and by the time you get to the factory the whole thing is lost, because the man who produces the machine does not have to fly in it. It is immaterial to him whether the changes are made. He does not have to fly the machine.

Senator FRELINGHUYSEN. There is a conflict of authority?

Col. ARNOLD. No. There is a lack of authority. There is no authority.

Senator FRELINGHUYSEN. There is no coordination, in other words?

Col. ARNOLD. No, sir.

Senator NEW. Col. Arnold, I note in the newspaper reports of yesterday, the day before, and also of this morning that six planes in an American bombing expedition that had set out were compelled to come down inside of the German lines, and were therefore captured. Have you any knowledge of the type of plane that was used in that raid?

Col. ARNOLD. No, sir; I have not. We have not gotten the report from the other side yet.

Senator NEW. No report has as yet been received?

Col. ARNOLD. No, sir.

Senator NEW. I asked that question for the reason that the capture of the entire outfit would appear to indicate that the machines were compelled to land through some common defect.

Col. ARNOLD. They were forced to land, through a lack of gas.

Senator NEW. Well, that might in itself be a defect. It might show that the machines consumed a great amount of gasoline; that the consumption of gasoline was so great that they could not, with safety, be sent upon a bombing expedition to a point at all remote. What I am trying to get at, and what I would like to know, is, if some common defect in the type of machine is responsible for the loss of a whole expedition. If so, I think that it is time the type should be changed.

Col. ARNOLD. The reports would indicate that a squadron of about 18 machines went over to do this bombing, and when they got through and started back toward their own lines they ran into a very strong head wind. Six of the machines, due to the small amount of gasoline they carried, were not able to get back and had to land; the other 12 machines got back.

The CHAIRMAN. Did they do any damage?

Col. ARNOLD. We never know what damage they do.

The CHAIRMAN. My question was perhaps clumsily worded. Were they captured before they reached their objective?

Col. ARNOLD. No, sir; they were on the way back. Our over-seas forces, our early forces, are equipped practically with whatever they can get. For instance, the A R 2 has not been used on the front lately to a great extent, but we have used it only because it is the only one we can get.

Senator FRELINGHUYSEN. What kind of machine is that?

Col. ARNOLD. It is a French machine.

Senator NEW. Is it obsolete?

Col. ARNOLD. It is not obsolete, but it is last year's machine.

Senator NEW. It has become a second-class machine?

Col. ARNOLD. Yes; it has become a second-class machine. We are absolutely using everything that we can get our hands on that will fly.

Senator NEW. Changing the subject completely and entering another field, from a private source I have a report that at Kelly field there are a great many planes that have been received there in boxes and that have not been unpacked for the reason that they are not satisfactory. Do you know anything about that?

Col. ARNOLD. The total number of airplanes at Kelly field, of all kinds, is 170. Out of that number they have 85 in actual flying commission; they have 65 out of commission.

The CHAIRMAN. Just about 50 per cent.

Col. ARNOLD. Sixty-five out of commission due to a lack of parts undergoing repairs and things of that kind. In answer to your question I should say—I think I know what you refer to, but I am not sure—when we first started out training a year ago, we were told by the production people that we had to meet a program of about 20,000 airplanes for this coming June. That was a big problem.

The CHAIRMAN. It has since been discovered to have been a big problem?

Col. ARNOLD. Yes. From our own side we were interested in this production. We had confidence in their ability to do it, but we discovered afterwards that they did not know what they were talking about. We had to train for that bunch a large number of aviators, so we accepted anything that would fly successfully, for training purposes. Therefore, we had this Standard airplane built, knowing when we bought it that it was only a makeshift until we could get sufficient Curtiss J N 4's to supply all the schools. We only ordered 1,600 Standards. We ordered something like 3,000 Curtisses. The Standard was a better manufacturing proposition and they could get quicker deliveries until the Curtiss people got going, and then they could get more J N 4's. So we got, I believe, 1,600 Standards delivered, as I remember now, some time in February. Then we started in with the Curtiss J N's. They began to come through, and as it is a better machine, we immediately began replacing the Standards with the Curtiss until along in June, due to the particular engine in the Standard machine catching fire so readily in hot weather. Gen. Kenly took it upon himself to absolutely throw out all the Standard machines until such time as they can be redesigned so that they can be successfully used in the training schools. So that at the present time we must have about 1,000 Standard airplanes stored at various places in Texas waiting until we can get technical men to work on the problem and to fix that machine and put in a Curtiss engine to make it satisfactory.

The CHAIRMAN. What engine were you using?

Col. ARNOLD. The Hall-Scott engine.

The CHAIRMAN. It is due to the fact that the Hall-Scott engine is not a proper engine for training?

Col. ARNOLD. It is.

Senator NEW. These are machines that have been used, but have since been replaced by what is regarded as a more satisfactory machine?

Col. ARNOLD. Yes, sir.

Senator NEW. And will remain out of commission until such time as they are redesigned?

Col. ARNOLD. Yes, sir.

Senator FRELINGHUYSEN. I would like to know why the Standard training machine is not suitable for training purposes. Is it the engine or the plane?

Col. ARNOLD. It is both. The engine in hot weather is liable to catch on fire at any time. All our burnings in the air, with the exception of one, have been caused by the Hall-Scott engine.

Senator FRELINGHUYSEN. And you have discarded it?

Col. ARNOLD. As soon as the hot weather came there were accidents. We had two in one week, showing that the weather had a great deal of influence on it. So Gen. Kenly said that we would not use any more of them.

Senator NEW. I suppose in those accidents the aviators were killed?

Col. ARNOLD. They did not have any chance at all. The machine just burned in the air before the aviator hit the ground.

Senator FRELINGHUYSEN. The man who designed that engine is now an officer in the Aviation Service in charge of inspection of airplanes at Buffalo and Dayton—Col. Hall; isn't that true?

Col. ARNOLD. I am not sure that he, individually, designed the engine. There are three or four Hall brothers. I do not know which one designed the engine. Of course, it is all a copy of the German Mercedes.

Senator FRELINGHUYSEN. Is the Hall-Scott engine now being manufactured?

Col. ARNOLD. As far as I know it is not.

Senator FRELINGHUYSEN. Was Col. Hall interested in the company that manufactured this Hall-Scott engine?

Col. ARNOLD. I imagine that he must be, because the Hall-Scott Co. is made up of the Hall brothers.

Senator NEW. I also have a report here of another incident about which I would like to inquire. I am told by an officer that 300 flyers were recently sent from the Waco Field to Hoboken and kept there a while. They were not ready for over-seas service because of a lack of sufficient training. The statement was made in the newspapers at the time that they were there for over-seas service. It was said that some time later 25 of them were sent across and the other 275 were sent back to Waco. Do you know anything about that?

Col. ARNOLD. That is correct, but the reasons are not correct.

Senator NEW. The reasons are not correct?

Col. ARNOLD. No, sir.

Senator NEW. What are the reasons?

Col. ARNOLD. Gen. Pershing said he wanted 300 R. M. A.'s, and they were sent to Hoboken. Then he changed his request and said he only wanted 25, so we sent the 25 overseas and the rest were sent back to Texas.

Senator FRELINGHUYSEN. What are R. M. A.'s?

Col. ARNOLD. Reserve military aviators. We can not tell the public everything like that.

Senator NEW. That is the report that has come to me, and I wanted to know about it.

Col. ARNOLD. Yes. Our actions are usually misunderstood.

(Thereupon, at 1 o'clock p. m., the committee took a recess until 2 o'clock p. m.)

AFTER RECESS.

STATEMENT OF COL. H. H. ARNOLD—Resumed.

The CHAIRMAN. Col. Arnold, your department furnished me with a record of the accidents upon our aviation fields up to the date thereof, assigning the causes and giving results to aviators. Has the Bureau of Aeronautics made any investigation as to these causes, and if so please state what and the extent to which your investigations have gone.

Col. ARNOLD. Our department has made very careful study of accidents, with a view of determining whether they were caused by the type of machine, the condition of the student, the degree of training of the student, the method of instruction, or any other one or more causes which might be determined. The idea was to eliminate as far as possible any causes which might add to the number of accidents which seemed almost unavoidable. The first thought that occurred was that probably the mental condition of the student had something to do with it, so trainers were obtained and put on duty at each school to watch the physical and mental condition of each student and report whether or not he should be allowed to fly on any particular day. Then, it was believed that it might possibly be the fault of the instruction, so special inspectors' schools were established so as to have a uniform method of instruction at all our schools. A study was made of curves, comparing the number of accidents on the different types of machines with the number of airplanes in use, the number of cadets flying, and the number of hours in the air for each type of machine. Another study was made showing the hours of the day at which accidents occurred. While a great deal of information has been obtained from these studies, the accidents occur practically in the same proportion as they did before the remedies were sought. At the present time we average in all training one fatality for about every 2,900 hours flown. While it is not possible to obtain the exact English and French figures on the subject, unofficial figures furnished show that the English have one fatality in their flying schools for every 1,000 hours flown.

The CHAIRMAN. That does not include fatalities on the front?

Col. ARNOLD. No, sir. The French in their training schools have fatalities for every fifteen hundred hours flown.

Senator NEW. In those cases the hours flown refer to training hours only.

Col. ARNOLD. They refer to training hours only; yes, sir.

Senator NEW. Not to hours flown in any other kind of flight?

Col. ARNOLD. These figures as given are comparisons of hours flown by the students performing the same operations at the schools in France, England, and the United States.

Senator NEW. So that the comparison is made exact?

Col. ARNOLD. Yes, sir. Steps are being taken now to obtain official confirmation of those figures. It is rather hard to get them.

Senator NEW. In other words, the accidents to the French are twice as many as ours?

Col. ARNOLD. Yes, sir.

Senator NEW. And the English three times as many?

Col. ARNOLD. Yes. It is rather difficult to obtain these figures, for naturally the French and the English both do not desire to publish the number of casualties during training. We have, however, as a basis of comparison, the result of fatalities of the Royal Flying Corps during their winter training at Fort Worth, which may be taken as a basis on which to figure the other fatalities in the English service. This information consists of actual figures taken from the records of the training schools in Texas and show that during the winter the Royal Flying Corps, while training our cadets, averaged 1 fatality for every 757 hours flown.

The CHAIRMAN. Have you any other data which is used as a basis for your calculation of a casualty for ever 1,000 hours of flying on the part of the British?

Col. ARNOLD. The statement that the British averaged 1 fatality for every 1,000 hours during training is based upon semiofficial information received by actual observers who served with the English during training. The French information was received in the same way.

The CHAIRMAN. Have you made any comparison as to the casualties occurring in the use of different types of training machines?

Col. ARNOLD. Yes, sir. We have made a study to determine whether or not, for instance, there were more accidents in the Curtiss during training than there were in the Standard, taking into consideration the number of machines used, the number of cadets flying, and the number of hours in the air. The results are slightly in favor of the Standard. However, due to the fact that we have had several cases of cadets burning to death in the air in the Standard type of machine and many very serious crashes in the Standard which did not result fatally, due to the sturdiness of construction of the Standard machine, it was believed by the director of military aeronautics that of the two machines the Curtiss was the most satisfactory.

The CHAIRMAN. Can you state the proportion of collisions to other classes of accidents?

Col. ARNOLD. Our records show a total of 152 fatalities between July 1, 1917, and July 1, 1918. Of this number 86 were caused by so-called stalls. By stalling is meant that the airplane loses its flying speed through one cause or another, usually caused, however, by the pilot making a mistake in the air. In all cases in a stall when the airplane loses its flying speed it either drops into a straight nose dive or turns into a tail spin. In case the airplane is up over 1,000 feet the pilot usually gets out of the spin or the dive before he hits the ground. In the case of experienced pilots, they can get out of these nose dives or tail spins at 500 feet, but under that height it nearly always results in a complete crash of the machine and the death of the pilot or capture. Collisions caused 30 deaths. Side slips caused 10 deaths. The other accidents were divided among many causes, no one of which predominated over the others.

The CHAIRMAN. What is the occasion of this relatively large number of collisions?

Col. ARNOLD. The records show that there were more collisions at Park field, Millington, than at any other place. I went to Park field a short time ago just to look over the field and find out, if I could, why they were having so many collisions. It appeared that

the commanding officer had taken every reasonable precaution against collisions. He had prescribed rules of the air which, if followed by the pilots, would have eliminated collisions. Even that did not stop collisions, however, and he went so far as to keep all machines on the ground except two. He started them out at opposite ends of the field and told them both to go around in the same direction and to fly at different altitudes, and these two men, being the only two in the air, he thought could not possibly collide, and yet they did so and both of them were killed. If the pilots will not look around to see where they are going and to see if there are other machines in the way they will collide, just the same way that automobiles collide on the street. You can not make a man think. You can give him instructions, but you can not make him carry them out.

The CHAIRMAN. You think that a principal factor is the thoughtlessness or inattention of the pupil?

Col. ARNOLD. I am positive that it is, because the old pilots never get into collisions. I know of no case on record in our country where an old pilot has been in a collision.

The CHAIRMAN. Are the students in all the fields given explicit instructions regarding the method of procedure in the air and warning as to the dangers of collision?

Col. ARNOLD. Yes, sir; they are given special rules of the air and made to memorize them and understand them thoroughly before they are allowed to go into the air.

The CHAIRMAN. What have you ascertained with regard to the existence of inherent defects in machines causing accidents, either as to a poor quality of material or poor workmanship upon the same?

Col. ARNOLD. Our records show only three accidents caused by machines collapsing in the air. One of these accidents happened at Fort Sill and killed two out of three men. In this case it was believed by everyone who saw it that the machine must have been hit by an artillery shell, for the machine was observing artillery practice at the time and no other cause could be given which would account for this accident. In the other case, the probabilities are that there was a weak spot in the machine which caused it to collapse in the air. The proportion, however, of collapses in the air is very small considering the fact that we are now flying approximately 3,000 hours per day and have approximately 2,400 machines flying every day.

The CHAIRMAN. Is the tendency toward increase or decrease in the number of accidents?

Col. ARNOLD. The number has markedly decreased, as shown by our records last winter at Fort Worth. They had one fatality for every 757 hours. We took over the school in April and since that time have averaged one fatality for every 2,600 hours.

Senator NEW. Since you took it over from the English?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Colonel, what is your method of inspection of training machines at your training camps? How efficient is it, in other words?

Col. ARNOLD. A new machine arrives on the field and is set up, inspected, and flown by the engineer officer whenever possible. In case the engineer officer does not fly he has an old pilot fly the machine for him to see that it is set up properly and properly adjusted.

After the initial flight and the final adjustments the machine is turned over to a working crew. The crew chief inspects the machine before and after each flight.

The CHAIRMAN. He is an officer, is he not?

Col. ARNOLD. No; he is a noncommissioned officer. The pilot is required to inspect the machine before each flight so that there are two inspections made of every machine before any flight.

The CHAIRMAN. How complete are your facilities for repair?

Col. ARNOLD. Every field is equipped so that if necessary it can entirely rebuild any machine.

The CHAIRMAN. What is the quality of your workmen?

Col. ARNOLD. Our workmen have improved materially in the last few months. Naturally, when we expanded so rapidly to start with we had poor workmen, but special emphasis had been put on their training so that now they are all doing exceptional work.

The CHAIRMAN. Is the material tested thoroughly which is used for repairing machines?

Col. ARNOLD. It is inspected very thoroughly before it is ever put into the machines.

The CHAIRMAN. The facilities for repairing and the quality of the material are both constantly improving?

Col. ARNOLD. Yes, sir; they are.

Senator NEW. I understand that Maj. Jones and Col. Bane have been sent away under orders. When will they be back? When do you expect that they will return?

Col. ARNOLD. They should be back by to-morrow night. The object of their trip was to make a final inspection of the Bristol to determine just what shall be done with it. The Production Division has not determined just what to do with the machine. They have tried the Liberty engine and the Hispano-Suiza engine in the machine, neither of which has made an entirely successful machine from the operating point of view, so that it looks very much as if the Bristol will not be put into production at all.

Senator NEW. Then, if not, it means that there has been a very great loss of time and a very considerable loss of money by the experimentation upon the Bristol machine up to this time, does it not?

Col. ARNOLD. Yes, sir. Col. Clark designed the Bristol to take the Liberty engine. His figures called for a total weight, including our military load, of about 2,900 pounds, I believe. When the machine was constructed and turned out ready to fly it weighed 3,600 pounds, 700 pounds more than it was designed to carry. No other model has been made in the Bristol since.

Senator FRELINGHUYSEN. Was that increased weight due to radiation?

Col. ARNOLD. The increased weight was due to changes made in the Curtiss factory by various people without consulting Col. Clark.

The CHAIRMAN. About what time was Col. Clark's design of the Bristol turned over to the manufacturers?

Col. ARNOLD. I do not know exactly, but about the 1st of November. Col. Clark turned over to the Curtiss Co. about 860 drawings of the Bristol.

In regard to this diagram, showing that the majority of fatalities occur about 3 o'clock in the afternoon, I wish to state that as soon

as we got that curve fixed up and found out that the majority of casualties occurred about 3 o'clock in the afternoon, Gen. Kenly said, "We will cut out flying at 3 o'clock," and so he has stopped all flying between the hours of 11 a. m. and 3 p. m.

The CHAIRMAN. Colonel, we are very much obliged to you for this information.

WAR DEPARTMENT,
DIRECTOR OF MILITARY AERONAUTICS,
Washington, July 20, 1918.

MY DEAR SENATOR THOMAS: In reply to your letter of July 15, there is attached herewith copy of the cablegrams which led to the cancellation of the Spad contract with the Curtiss Co.

Very sincerely,

H. H. ARNOLD,
Colonel, Signal Corps,
Assistant Director of Military Aeronautics.

HON. CHARLES S. THOMAS,
United States Senate, Washington, D. C.

[Outgoing.]

Our 359, paragraph 7, dated November 3, 1917:

"For Bolling: We have contract with Wright-Martin Company for five hundred 150-H. P. Hispanos and thirty-five hundred 220-H. P. geared Hispanos. We have practically decided to increase the order for 150 H. P. engines to one thousand, to be used for our advanced training program and order three thousand 300-H. P. Hispanos, drawings of which are here. Mr. Chapuis is here also. We can get production on 300 H. P. practically as soon as on the 220 geared. The tool work has not progressed so far as to make change impossible. We understand from Mr. Chapuis that the 300 H. P. has passed the fifty-hour test. Please cable your recommendation at once."

[Incoming.]

State Department cable 2775, paragraph 3, dated November 20, 1917:

"Your three fifty-nine, paragraph seven. Your programme, Hispano engines. build no two-twenty Hispano for use here which can not be delivered here by June first next year, except such as you desire for United States needs. Probable that two-twenty Hispano will be followed by five hundred. Reference, three hundred Hispano. This engine will require change in airplane. No fully satisfactory airplane yet designed this country, therefore think quantity deliveries here could not be made before June first, after which time more than three hundred horsepower will be necessary."

[Outgoing.]

Our 461, paragraph 1, dated November 30, 1917:

"For Bolling: Reference your 2775, State 273, paragraph 3: Curtiss Company have completed drawings and ordered material for Spad for 220-H. P. geared Hispano. We have canceled that order. Tulasne suggests possibility of helping the French program by building Spad planes here to be equipped with 220-H. P. geared Hispano engines built in France. We could get production in February without materially affecting output of two-place fighters. We are not urging this because of the fact that we have ordered material which can be utilized in other machines, but if it would help your program, here is a quick source for these machines."

[Incoming.]

Dated December 14, 1917.

* * * * *

With reference to paragraph 1, your cablegram 461, do not recommend unionized production Spad airplanes for France. No such request received from French here. Believe they can produce all these airplanes they need. Think our whole efforts should be applied airplanes and engines already on our program. United States should leave production single-place fighter to Europe.

PERSHING.

STATEMENT OF LIEUT. COL. V. E. CLARK.

Senator NEW. Please state your name and rank.

Col. CLARK. Lieut. Col. V. E. Clark, of the Air Service.

Senator NEW. What is your relation to the Aviation Service?

Col. CLARK. At the present time, sir, I am on duty with the Technical Section in the office of the Director of Military Aeronautics.

Senator NEW. How long have you been in the service?

Col. CLARK. Fifteen years.

The CHAIRMAN. Whom do you mean by the Director of Military Aeronautics?

Col. CLARK. Gen. Kenly.

Senator NEW. Through what avenue did you go into the military service?

Col. CLARK. I am a graduate of the Naval Academy, sir, of the year 1907. Two and one-half years after graduation I transferred as a second lieutenant in the Coast Artillery, and in 1913 I was appointed in the Aviation Section.

Senator NEW. You are a military aviator?

Col. CLARK. Yes, sir.

Senator NEW. Not a junior aviator?

Col. CLARK. A military aviator.

Senator NEW. How long have you been flying?

Col. CLARK. Five years, sir.

Senator NEW. Have you had any particular education, training, or experience to fit you as an engineer for airplane designs; and if so, what?

Col. CLARK. Before I had an opportunity to start to learn to fly I studied the theory of airplane design and the principles of flight as much as I could out of such textbooks as there were at that time. When I started to learn to fly I attempted to analyze the flights I made and the flights that my associates made. In September, 1914, I was sent as the only Army officer attending a post graduate course in aeronautical engineering, both theory and practice, of airplane design, at the Massachusetts Institute of Technology, and immediately after that I was put in charge of the experimental and repair department of the Aviation Section, which was at San Diego; and since June, 1915, I have been the chief aeronautical engineer in the Army.

Senator NEW. Have you been on duty in Europe since we entered the war?

Col. CLARK. Yes, sir. I went to Europe——

Senator NEW. In what capacity and what were your services over there, please?

Col. CLARK. I was selected as the airplane engineer on a commission composed of three officers from the Army, two from the Navy, and two civilians. Col. Bolling, then Maj. Bolling, was the chief of the commission. We went to England, France, and Italy, and our duty was to attempt to negotiate with the foreign Governments regarding the production of certain airplanes in the United States and the production of certain airplanes in Europe for the use of our troops. In addition to that I was assigned the duty of getting all available data concerning the development of airplane design and

construction and reporting it back to this country from Italy, France, and England.

Senator NEW. Did you make any report recommending any types of airplanes for production by the United States?

Col. CLARK. Yes, sir; I was instructed to do so. After I had been to all three countries and been through all factories I submitted a report by cable, which I confirmed later immediately upon my arrival back in the United States in September of last year.

Senator NEW. Were your recommendations carried out?

Col. CLARK. No, sir.

The CHAIRMAN. Have you a copy of that recommendation?

Col. CLARK. No, sir; that was in a number of memoranda which I turned over to Col. Deeds. I think Col. Waldon should have copies. I have not been able to find my retained copies. They should be on record in the War Department.

The CHAIRMAN. That was during the time that Col. Squier was in charge of the military branch?

Col. CLARK. Yes, sir.

Senator NEW. They were official recommendations, and as such should be on file at the War Department, I presume?

Col. CLARK. Yes, sir; they were turned over to Col. Deeds, who was my immediate chief.

Senator NEW. I suggest that copies of those recommendations be requested by the committee for its use, Mr. Chairman. You say your recommendations were not carried out. Do you know why not or have you any opinions as to why they were not?

Col. CLARK. I believe, sir, that it was something like this: I made my recommendations, and in the main they were accepted, and action was started in the way of placing tentative orders for the development of the various machines at the various factories. It so happened, through no intention on my part, that of the six types that I recommended three were British, two French, and one Italian. That happened without any intention to divide it among the nations on my part, but merely from judging what I took to be the relative merits of the airplanes.

The CHAIRMAN. That was a mere coincidence?

Col. CLARK. A mere coincidence; yes, sir.

Senator NEW. To get a variety of planes?

Col. CLARK. There were six military types distinct as regards military functions, and it so happened that three were British, two French, and one Italian. Probably a week or two after action had been started on my recommendation the French commission in this country, for instance, heard that action had been started and called on Col. Deeds and Gen. Squier. This is largely theory, because I have gotten it in roundabout ways: I was not present at any of the conferences, but I heard about it. The French commission would call on Gen. Squier and Col. Deeds and they would say, "We understand you have ordered three British types. We do not want to start any trouble, but we believe that the Breguet and the Spad and the Le Tord are superior to the corresponding machines that the British have, likewise the Italian commission, and so on." It is my opinion that the pressure that they brought to bear was suffi-

cient to bring about more or less of a vacillation on the part of the authorities.

The CHAIRMAN. In other words, they complained that you were discriminating against the French and Italian in favor of the British machines?

Col. CLARK. I think they were quite sincere in their belief that the French were superior machines.

Senator NEW. Will you state what the six types of machines were which you recommended and the purposes for which each type was designed; that is, which were scout planes and which were pursuit planes and which bombing planes, et cetera?

Col. CLARK. For day bombing I recommended the D. H. 9, to take the Liberty 12-cylinder, direct-drive engine—redesigned accordingly. For observation work—that is, control of artillery fire and photography over tactical area, etc.—the so-called Corps or Army observation machine, I recommended the Bristol Fighter redesigned to take the Liberty engine. For a single-seater pursuit I recommended the Martinsyde to take the Liberty eight-cylinder engine. As a single-seater combat I recommended two types, both the Spad, one with 150-horsepower Gnome engine and the other with 180-horsepower Hispano-Suiza engine, and for night bombing I recommended the Caproni triplane.

The CHAIRMAN. Were those recommendations of yours made with the approval of Col. Bolling?

Col. CLARK. Yes, sir. In fact, they were made in a cablegram sent as a result of conferences that we held daily and nightly over in France. I was assigned the duty by Col. Bolling to decide on these various types, and he sent through my recommendations.

Senator NEW. Have we built any airplanes in this country for service at the front?

Col. CLARK. Yes, sir.

Senator NEW. What type or types?

Col. CLARK. The D. H. 4 is the only one I know of.

Senator NEW. Is that type successful, do you think?

Col. CLARK. No, sir; except in a very limited sense.

Senator NEW. Why? Just give us your ideas now of the reason why it is not.

Col. CLARK. The attributes in which it fails or the reasons for failing?

Senator NEW. Both the attributes in which it fails—and I would like to have your opinion as an expert and as a flyer of the D. H. 4, and if it has defects that disqualify it in any degree I would like to know just what they are. Tell us freely what you think of it.

Col. CLARK. In the first place, I think that for the military functions which it should perform in France the performances are not as good as they should be. It is barely good enough to cope with the situation as it stands to-day, and will certainly not be good enough in a few months to stand up and take its part evenly with the German machines. By performances I mean the ceiling and the high speed at high altitudes and the rate of climb. Then, the D. H. 4 is a machine that this year hardly fits in any place. It is not a bomber. It has not the proper compartments in the fuselage to carry the bombs and release them. It is not a fighter. Vision for the pilot

is very poor, and the means of communication between the pilot and observer are very poor. Those two things are absolutely essential in a fighter. It is not a good observation machine for the same reason that it is not a good fighter.

The CHAIRMAN. You say it is not suited for observation. That is because the seats are too far apart?

Col. CLARK. That is one contributing factor; yes, sir. That covers the performance and the military attributes of the machine. In the matter of details, we have not a satisfactory radiator for it. In the first place, we found it very difficult to cool the Liberty engine in the De Haviland 4. The radiators we have built have been of rather poor workmanship. The machines which we have shipped abroad have been very unsatisfactory to them over there, aside from other reasons, on account of the poor inspection. The workmanship was poor. The ailerons and tail surfaces were fitted on very loosely. The exerciser cord that serves as a shock absorber for the landing gear was wound poorly.

Senator NEW. You say they have been unsatisfactory in the service over there. How do you know that?

Col. CLARK. I have seen two reports, one a cablegram from Col. Dodd, who was assigned the duty by Gen. Foulois of investigating the merits and demerits of the De Haviland 4 as we have sent it over, and another report I have seen from Capt. Hucks, of the British Royal Flying Corps, who was assigned the duty of testing the first De Haviland 4 with the Liberty engine which was flown in England. Both these reports indicate that the machine is very unsatisfactory as it is now built. You asked me to what I attribute the fact that the machines are more or less unsatisfactory?

Senator NEW. Yes.

Col. CLARK. I believe that in the case of the De Haviland 4 there are two primary contributing factors. One is that the engineers who were placed in charge of the redesign and development of the machine neither had any knowledge of the fundamentals of airplane design, either by education or experience, nor did they have any knowledge of what the military flyer actually doing service at the front needs—what his actual requirements of the machine are. I think that no man ought to be assigned to the developing of a service airplane unless he has had some dealings with fighters at the front. I mean that he ought to get that atmosphere. If they do not get the fighter's attitude, they will, for instance, be making fittings throughout the machine which are very easy to build, from the production standpoint, but which will be just a little bit heavier or offer more head resistance to the air. By the time you get through you will have practically ruined what was a good machine by loading it down and adding this resistance. For instance, in the case of the De Haviland 4. That was designed by Capt. De Haviland, who is a very highly educated aeronautical engineer, and he has had years of education and experience, and who—over there in England—

Senator NEW. He is an English officer?

Col. CLARK. He has been appointed an English officer. Before that he was first in the royal craft factory as an engineer and later with the Aircraft Co., which is the company which mak-

the De Haviland machines. Over in England now he is in a position to be constantly in touch with the flyers at the front. He interviews every man that comes back who is thoughtful about analyzing the conditions at the front. He uses that information in the development of his machines. The De Haviland 4 and all the De Haviland machines are a consequence of that man's labor along that direction. Not only that, but the De Haviland 4, as it was turned over to us, was a highly developed machine. The first De Haviland 4 built was very poor, like all other machines—the first experimental ones of new types. They found glaring faults, corrected those faults and built a sufficient number, until the machine had reached a high point of development through eliminating these faults. This machine—the acme of refinement—came over here and was turned over to men who have not the slightest education in aeronautical engineering and have not in the slightest degree the flyers' viewpoint.

Senator NEW. The De Haviland machine was sent over here for use as a model?

Col. CLARK. Yes, sir.

Senator NEW. To whom was it delivered?

Col. CLARK. To the Dayton-Wright Co. As an indication of the attitude of the people who have taken that machine and changed it from what it was, I cite the case of an officer who not only admits but boasts that he has made 3,600 changes in that machine after a man like De Haviland has developed it to the point where it was when it arrived over here.

Senator NEW. Who is that officer?

Col. CLARK. Maj. Hall. I believe he is a lieutenant colonel now.

Senator NEW. Of the Hall-Scott motor?

Col. CLARK. Yes, sir. The same man.

Senator NEW. Maj. Hall is the designer of motors, but has he had any experience as a designer of aircraft?

Col. CLARK. Absolutely none. Not only that, but he has never been in touch with flyers; certainly never with flyers who have been actually flying at the front.

Senator NEW. He has been permitted to make those changes in the De Haviland 4 machine?

Col. CLARK. Yes, sir. That is, I am not saying that he made them. He boasts that he has made them; that he has made 3,600 changes.

Senator NEW. Tell us, Colonel, what is the essential difference between the De Haviland 4 and the De Haviland 9.

Col. CLARK. The De Haviland 9 was redesigned by Capt. De Haviland, taking the De Haviland 4 as a working basis. It was designed to act as a day bomber. He did it by moving back the rear seat, called the gun-fighter's seat, about a foot and a half and then moving back the pilot's seat until it was directly in front of the rear seat and very close to it, giving direct communication between the two. Then he left a long space between the front man and the engine, long enough to permit not only the necessary fuel for the work but also to put in a bomb compartment. The wings are practically the same. The tail is practically the same. He has increased the wing surface slightly to take care of the additional load, but the layout of the machine is much the same as the De Haviland 4.

Senator NEW. Your recommendation of the De Haviland was for the 9 model?

Col. CLARK. Yes, sir; not the 4.

Senator NEW. Colonel, classified according to military function, what types of aircraft should we build?

Col. CLARK. First, observation; second, single-seater pursuit; third, two-seater fighters; fourth, day bombers; fifth, night bombers, and, sixth, what might be called ground-harassment machines. I have never heard a standard name for it, but over there it is called the machine for groundwork.

The CHAIRMAN. Something like the Penguin?

Col. CLARK. No, sir. I mean a machine for coming down and raking the trenches and shooting up transports. This is all aside from training machines. Of course, we would have primary and advanced training machines.

Senator NEW. I made no references to training planes. I was asking solely about machines for direct military use. Have we a plane for army observation?

Col. CLARK. We are not building any; no, sir. There was an attempt to redesign one for that purpose, but it is not being built.

Senator NEW. What plane is that?

Col. CLARK. It is a redesigned Bristol fighter.

Senator NEW. Is it successful or otherwise?

Col. CLARK. I am told that it is very unsuccessful, although I have no direct knowledge of it.

Senator NEW. Was the original of that machine satisfactory or is our copy of the original not good?

Col. CLARK. The original was eminently satisfactory for that work, and I think it is considered not only in England but by the Frenchmen that the best machine from the standpoint of vision and all-round work of observation is the Bristol fighter.

Senator NEW. To what do you attribute that lack of success in reproducing the Bristol machine?

Col. CLARK. I think it is much the same there as in the case of the De Haviland 4 except I think that one additional factor has come in there. As I say, it is, first, lack of knowledge on the part of the engineers and the lack of appreciation of the flyer's viewpoint; and, second, I think that in the case of the Bristol fighter—I firmly believe that in the case of the Bristol fighter a large part of the failure is due to antipathy of the Curtiss Co. toward the Bristol design. I think this is due to the fact that they have a very deep-rooted belief that Curtiss designs are better than Bristol designs, and I believe that as long as they have that attitude they could not turn out the machine as it should have been turned out.

Senator NEW. That is a pretty serious reflection.

Col. CLARK. Yes, sir; but I believe that.

The CHAIRMAN. Has the weight of the Liberty motor, as compared with the weight of the Rolls-Royce as it was originally designed, anything to do with it?

Col. CLARK. The Liberty 12 is not an ideal engine for that machine to do that work, but I believe that had the design been up to average all the way through that a really satisfactory machine would have developed.

The CHAIRMAN. You designed a Bristol of the English models, did you not?

Col. CLARK. Yes, sir; I started that design.

The CHAIRMAN. Did you complete it?

Col. CLARK. I completed it except for a few details that were not susceptible of completion at that time. I mean the addition of throttle, and so forth, controls, which would necessarily come after the first rough model had been built.

The CHAIRMAN. At whose direction did you do that?

Col. CLARK. Col. Deeds.

The CHAIRMAN. To whom did you deliver the plans of the design?

Col. CLARK. To the Curtiss Co.

The CHAIRMAN. Is that the original of their own plans for production?

Col. CLARK. That I do not know, sir. From the time that I delivered those drawings to them last November, I have never been allowed to keep in touch in the slightest way with the Curtiss factory.

The CHAIRMAN. You were never consulted?

Col. CLARK. Not in the slightest.

The CHAIRMAN. Neither by the authorities in Washington or by the Curtiss people?

Col. CLARK. By neither.

The CHAIRMAN. Both knew that you made the designs?

Col. CLARK. Yes, sir.

The CHAIRMAN. Do you know why that was? Was any reason ever assigned to you for it?

Col. CLARK. No, sir; no one has ever told me why. I have something here that may be of interest in that connection. Mr. J. G. Perrin was employed and assigned to assist in the preliminary design that I made. Then, after that design was completed, he was assigned by Col. Deeds to work at the Curtiss factory with the Curtiss engineering force as the authorized Government engineering representative, to advise them and instruct them as things came up.

The CHAIRMAN. Who is Mr. Perrin?

Col. CLARK. He was an automobile engineer. He was chief engineer, I believe, at one time, of the Lozier Automobile Co.

The CHAIRMAN. Did he know anything about flying?

Col. CLARK. No, sir.

The CHAIRMAN. Do you know why he was assigned to keep in touch with the development of the machine at the Curtiss plant instead of you?

Col. CLARK. Yes, sir; I think I do. I was assigned to command McCook Field during its course of construction, which was just about that time and during the first part of its operation, and I believe it may have been that the authorities considered McCook Field more important.

The CHAIRMAN. You were about to refer to some document when I interrupted you. What is that document?

Col. CLARK. Here are exact extracts from a diary that Mr. Perrin kept, and there are some items in this that I think are very significant.

The CHAIRMAN. Are you at liberty to use these?

Col. CLARK. Mr. Perrin turned that over to me and I think they are of record in the War Department. The diary and report were turned over to Maj. Gray.

The CHAIRMAN. Where is Mr. Perrin now?

Col. CLARK. Mr. Perrin, I believe, is in Washington. He was in Washington a week ago. I did not finish in regard to the contributing causes to what I consider to be the failure in the Bristol, and I think the same thing applies to the De Haviland 4. The third big reason, I believe, for the failure of both the De Haviland 4 and the Bristol fighter was the lack of coordination on the part of the authorities over the production engineering in Washington. That is, there was not coordination between the heads of the various departments. For instance, one man was responsible for the installation of armament, another was responsible for the camera, another for the radio outfit, and another for bombs and bomb sights. There was no head and no coordination between those various departments, with the result that any Tom, Dick, and Harry could go to the Curtiss factory where the Bristol fighter was being developed or the Dayton-Wright factory where the De Haviland 4 was being developed, and he would say with evidently full authority, "I want the camera put in here," and that would necessitate changes in the drawings and specifications in the machine. Another man would want a bomb sight here and another man would say that the machine-gun sight was not on right, each one going up there apparently with full authority. I do not believe any engineering organization could go ahead in that way. I believe that the Curtiss Co., with the best intentions and the best ability in the world, could not have done anything with the machine.

Senator NEW. Have you developed or copied a successful single-seater machine for flying?

Col. CLARK. No, sir.

Senator NEW. What was your recommendation regarding this type, if you made one?

Col. CLARK. I recommended for a single-seater combat plane the Spad, and for a single-seater pursuit the Martinsyde. Neither was ever built. I understand now, one year after my recommendation, they are considering starting in on the Martinsyde.

Senator NEW. Why was not your recommendation carried out: do you know?

Col. CLARK. I think it was purely a lack of confidence in me, especially when they had foreign commissions calling on them who had been through the war, and flyers who had flown at the front. I think they allowed their opinions to have more weight than mine. However, their opinions always conflicted; that is, the British would conflict with the French and the opinions between the different flyers would conflict. When I went over there I found that the only way to get reliable, sound dope was to go right up to the front or right down to the factories, or interview not only one or two flyers from the front, but hundreds of them. Many of them were prejudiced, and it took interviews with dozens of them to come to any sound analysis.

Senator NEW. How about the two-seater fighter?

Col. CLARK. We have none, sir. The most promising development we have in that line is the two-seater fighter that Capt. Le Pere, of

the French Army, who was allowed to come over by the French Government, has designed and built as an experimental job at the Packard factory. I, myself, designed a machine for this work, but it certainly is not a success as it stands now. It has been built and flown.

Senator NEW. Then, we are doing nothing to produce a two-seater fighter?

Col. CLARK. No, sir; I would not say that. I think that the Le Pere development is very promising.

Senator NEW. But there are none in production.

Col. CLARK. Not with'in a year or so.

Senator NEW. The Le Pere model has not been accepted?

Col. CLARK. Not to the best of my knowledge; no, sir.

Senator NEW. How about the day bomber?

Col. CLARK. Nothing has been done on that. There have been drawings made of the De Haviland 9, and I believe that McCook Field has gone ahead with a modification of the De Haviland 9, which is called the U. S. D-9, but nothing as far as production is concerned has been done.

Senator NEW. No other production in regard to machines of that type?

Col. CLARK. Nothing that I can think of.

Senator NEW. How about the night bombers, the big fellows intended for long-range attacks?

Col. CLARK. When I returned, and by cable before I returned, I recommended the Caproni triplane to be built to use three Liberty 12-g geared motors. A geared motor is, in my opinion, an absolute necessity for that slow-speed work. I said that, in my opinion, if the Handley-Page could be put in production much more quickly than the Caproni triplane, the Handley-Page should be built. There is not a great deal of choice between the two. The Caproni I consider the better, but not enough to warrant any delay in production. As far as I know, nothing has been done about any of them.

Senator NEW. You recommended those machines a full year ago?

Col. CLARK. Yes, sir; I recommended one or the other, but I certainly did not recommend both; and it will be fatal if we attempt to build both and send them to the other side. The matter of handling spare parts for the two machines over on the other side is a serious matter. I believe that our men on the other side will agree with me on that—that it is a fatal error to attempt to build both machines, both the Handley-Page and the Caproni; and I believe, from what I hear, that they are now planning to build them both.

Senator FRELINGHUYSEN. Planning to build the Caproni biplane?

Col. CLARK. No, sir. But it means two machines for the same work, and it means lack of interchangeability for parts.

Senator FRELINGHUYSEN. How does the Caproni biplane compare with the Caproni triplane in effectiveness?

Col. CLARK. The Caproni biplane is considerably better for the type of work that the Italians perform; that is, bombing by day. I saw a squadron of 10 Caproni biplanes go over the lines near Trieste and attempt to bomb a railway station in broad daylight, with no Austrian airplanes going after them, through the barrage, and return safely. If you are operating under conditions like the Italians

have been operating under, a biplane is better; but for our work on the western front, where you can not go out in the daytime with a clumsy machine, the triplane is certainly better, in my opinion, because it carries three times the number of bombs. That is, if it goes out 100 or 150 or 235 miles, as it is to Essen, you can send out three times as many bombs per one pilot and one bomber; and, in view of the fact that it is pretty precarious whether they are going to get back or not, it is well to drop as many bombs as possible for each man out.

Senator NEW. You believe in night bombing, do you?

Col. CLARK. Yes, sir; I certainly do.

Senator FRELINGHUYSEN. Do you know, from your knowledge, whether the Government contemplates building any of the Caproni triplanes?

Col. CLARK. I have no knowledge of those things. I have been completely out of touch with them for six months, but I understand that they are not going to build any triplanes, but are considering building both the Caproni biplanes and the Handley-Page.

Senator FRELINGHUYSEN. Did you observe the flying of the Handley-Page at Elizabeth?

Col. CLARK. No, sir; I did not see that in flight. I have flown in one in England.

Senator FRELINGHUYSEN. Have you heard any reports of that test?

Col. CLARK. I have heard nothing of any official tests. All I know is what I saw in the paper.

Senator FRELINGHUYSEN. You are familiar with the machine?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. Were those geared Liberty motors?

Col. CLARK. I think they are using the low-compression direct-drive type, not geared. They should be geared for that type, but they are not.

Senator FRELINGHUYSEN. Do you believe that is sufficient power for the Handley-Page?

Col. CLARK. Yes, sir; I believe that if they use two geared motors they can get sufficient power, but they can not do a thing with two direct-drive motors.

Senator FRELINGHUYSEN. Did you observe the trial flights of the Caproni, which was built under the direction of Capt. D'Annunzio at the Standard plant and assembled at Mineola?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. Carrying three Liberty motors?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. You have seen no report of that?

Col. CLARK. No, sir.

Senator NEW. Has our Army designed any service machine?

Col. CLARK. The only attempt I know of was an attempt I made at the McCook Field to design a two-seater fighter to mount five machine guns. I designed it around a straight spur-geared Liberty 12-cylinder engine.

Senator NEW. Was it successful?

Col. CLARK. No, sir; it certainly was not successful as first flown, although it had a very good performance. I was never permitted to do any development work on it whatsoever. It was flown, and

they said that the engine was no good, and that they would not build any more engines. I was not allowed to remain back there, and all development was stopped. I think that I can say that never in history has the first experimental machine of a new type been any good.

Senator FRELINGHUYSEN. What do you mean by a service machine?

Col. CLARK. A machine designed for some one of the five or six military functions at the front. I have here a technical report by Alexander Klemens, who had the chair in aeronautical engineering at the Massachusetts Institute of Technology, on the C-1. It is a report to Lieut. Col. Horner from Alexander Klemens. I might say that the first time this machine left the ground it climbed 10,000 feet in less time than any two-seater machine has ever climbed to that altitude, with the motor turning out 150 horsepower shy of what was promised on the motor. The report is as follows:

From: Alexander Klemmin.

To: Lieut. Col. Horner.

Subject: U. S. A. C-1 two-seater fighter airplane.

1. In compliance with instructions from you I submit the following report concerning this airplane:

Military characteristics and vision.—The machine has been flown and landed with full military load, which comprises two forward guns, two rear cockpit guns, and one gun firing through the floor, with full ammunition. The gun firing through the floor is particularly valuable for this type of machine. The firing angles are good and there should be almost no blind spots. The vision is exceptionally good, both front, up and down, and rear.

Longitudinal stability and controllability.—When flown initially with full military load the machine was slightly tail heavy, but with a positive adjustment of the stabilizer. Mr. Johnson, who has piloted the machine several times, finds excellent longitudinal balance and controllability.

Lateral stability and controllability.—The first rudder employed was a little blanketed by the fuselage, and the ailerons were stiff. With a larger, higher rudder, and two hinge supports for the ailerons, the machine responds well to all lateral controls, but its lateral stability is only fair.

Landing and starting.—The machine makes a good get-away and lands well.

Structure.—The rear upper wing spar is of too small a section and requires reinforcement. The opening through the floor weakens the fuselage somewhat, and requires a veneer gusset plate around it. No undue vibration or weakness has been exhibited in flight, but structure may need experimental revision.

Stream line.—The gap between the fuselage and lower wing is somewhat wasteful of resistance. Other parts of the machine require cleaning up from an aerodynamical point of view.

Weight and performance.—With complete military load, including fuel for 3½ hours (400 horsepower near the ground) and the 5 guns, the weight is about 3,900 to 4,000 pounds. This gives a somewhat heavy loading of 9.3 pounds per square foot wing area, but the machine being designed for 475–500-horsepower motor, would give only about 8.2 pounds per horsepower should 475 horsepower be developed. This would compare very favorably with, say, De H. 4 as a fighter, which has 3,550 for 400 horsepower, i. e., about 9 pounds per horsepower.

Radiation.—Radiation constitutes a serious difficulty for this high power. A gap in front of the fuselage, wasteful of resistance, has been used in addition to a forward and underslung radiator. The machine has been flown with gap closed in.

General conclusions.—With experimental revision, strengthening of this structure, and some cleaning up, this machine will be a very interesting airplane design, because of its good military characteristics and vision. The difficulties in the way of successful carry-through are found to be engine and radiator problems. If it were possible to obtain enough power to give 8.2 pounds per horsepower, the machine would have an excellent speed and climb, comparing more than favorably with other machines of this type, but it would be necessary to develop in the neighborhood of 475 horsepower.

2. This report is written entirely from memory.

ALEXANDER KLEMIN.

The CHAIRMAN. What machine are you now talking about?

Col. CLARK. The C-1, the combat 1.

The CHAIRMAN. Who built it?

Col. CLARK. It was built at the McCook field.

Senator FRELINGHUYSEN. Where is that machine now?

Col. CLARK. At the Wilbur Wright field.

Senator FRELINGHUYSEN. Did it go through the various sand tests?

Col. CLARK. No, sir; because they only permitted me to build just one and that was flown, and it means at least one additional structure——

Senator FRELINGHUYSEN. Who do you mean by "they"?

Col. CLARK. The production department.

The CHAIRMAN. When was your machine constructed?

Col. CLARK. We started construction in the latter part of December, and I was ordered away from the McCook field in January.

The CHAIRMAN. Why were you ordered away?

Col. CLARK. I do not know, sir. I understand that those in authority have made the statement, never to me, however, that my work at McCook field was not satisfactory. That statement has never been made to me in any form.

The CHAIRMAN. Who succeeded you there?

Col. CLARK. Col. Vincent.

The CHAIRMAN. Who appointed you there in the first place?

Col. CLARK. Col. Deeds.

The CHAIRMAN. Were you removed by the same authority?

Col. CLARK. Yes, sir.

The CHAIRMAN. What reason was assigned for removing you?

Col. CLARK. Col. Deeds told me that he had a very important position for me; that he wanted me to come to Washington to sit at his right hand and advise him on all matters pertaining to basic policy. I was never given any duty in Washington. I was sent around from pillar to post. I have not done any useful work since January.

The CHAIRMAN. You did not sit at his right hand or at his left, nor were you consulted in matters of basic policy or otherwise?

Col. CLARK. No, sir.

Senator NEW. Did you recommend any particular types of training planes?

Col. CLARK. Yes, sir; I recommended the Curtiss JN 4 for primary training and the Bristol Scout with the 80 Le-Rhone engine for advanced training.

Senator NEW. Were your recommendations in reference to those machines carried out?

Col. CLARK. In the case of the Curtiss JN 4 the machine that I recommended was not built as it was then designed, but Col. Waldor made several changes in design and the machine was built as he redesigned it. Since that date all of the changes that he made at that time have proven unsatisfactory and the original design has been gone back to and the machine is flying to-day. In the case of the Bristol Scout—it was decided to build an experimental Thomas-Morse machine in place of the Bristol Scout. I only know of three flyers, Maj. B. Q. Jones, Capt. Hammond, of the Royal Flying Corps, stationed at McCook Field, and another, Mr. Hambley, who have flown the two machines, and in the opinion of all three there is no

comparison between the machines. The Bristol Scout is ideal for the purpose and has been developed after years of experimentation. The Thomas-Morse certainly has been unsatisfactory.

Senator NEW. Have you ever heard any reflections on the character of the inspections in the Thomas-Morse works?

Col. CLARK. Not in the case of that work in particular; no, sir.

Senator NEW. Here is a pretty broad question: What has been wrong with our system to account for our failure to produce more successful service machines? Just go ahead and answer that freely in your own way. I want your opinion.

Col. CLARK. First, I think it was a matter of vacillation on the part of those in authority about what to build. They seemed to have confidence in no one person or they did not appoint a board whose decisions they were willing to abide by, and as a consequence they were ruled first by the opinion of one man and then by the opinion of the French Commission and then the British Commission and then the Italians came in. As a result at the end of two or three months of that they were absolutely up in the air and had started on nothing—had changed their orders with manufacturers at least two or three times in each case. Then, I think that there was, and I believe that there still is, a lack of proper organization in the Production Department. When the equipment division was first organized they sent out and got from the business world and the automobile engineering world a great many very capable and very successful men. But they got them without any definite idea, except possibly in one or two cases, of what they were going to do with each man as they brought him in. The idea was that they were all to just come in and “help.” They all arrived—no one man knew what his job was and no one could find out what his job was. A paper would come in or a matter would come up for decision and it might be referred to any one of half a dozen different officers. That is, there was no real organization. I do not believe a system like that is sound, and I do not believe we are going to get any place with it.

Senator NEW. Do you think that condition still prevails?

Col. CLARK. I have not been near the Production Department for six months, but I have been told by other officers that that is the condition.

Senator NEW. Colonel, as to our engineers, the engineers who are responsible for redesigning planes, do you think they have had the requisite training or experience to qualify them for the positions they now hold?

Col. CLARK. Senator, of course, I claim to be an engineer for airplane design, and I realize when I state what I am going to state that I take a chance of receiving from you very severe criticism. The only thing that is in my mind is whether this committee is willing to accept my opinion on the thing.

Senator NEW. We are after the truth, but we do not want anybody wearing the uniform to make statements which might subject them to discipline by their superiors.

Col. CLARK. I do not fear that, sir; but it is a matter of whether the committee is willing to consider my opinion on the thing. I may be prejudiced and I may be jealous.

Senator NEW. We will try to give it the weight that we think it merits.

Col. CLARK. I do not believe that until a man has had considerable technical education and practical engineering training and has had at least three or four years' intimate association with the construction and design and repair of airplanes and association of three or four years' with actual flyers—very close association—I do not believe that he will arrive at a state where he ought to be depended upon to pass decisions on vital parts in airplane design. I can see men who are responsible to-day for the development of our experimental jobs making mistakes in absolutely the most fundamental things, which are at the same time most vital. They are vital as far as the military performance of the airplanes go. In other words, they are now passing through a stage where they know more about airplanes than they ever will again. They have had about a year, and it is my experience that at the end of that length of time you know more than you ever will again. I mean that, in your own opinion, you know more about the thing than you ever will again. You can not make very many mistakes on airplanes.

Senator NEW. You mean that they feel more confident at that stage in their experience that they know all about it than when they know more.

Col. CLARK. Yes, sir; they have a certain amount of knowledge. At such a stage there is no mystery about it, and the mathematics of stability do not amount to anything. After a year things will commence to happen which they can not account for by their knowledge, and they will have less and less confidence as the years go by in their ability and more and more respect for that of others.

Senator FRELINGHUYSEN. Are you familiar with the contract which was given to the Curtiss Co. for 3,000 Spad machines?

Col. CLARK. I am, to some extent; yes, sir.

Senator FRELINGHUYSEN. Was that contract entered into in compliance with your suggestion that we build the Spad single-seater fighter?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. How long after your report was that order given?

Col. CLARK. My cablegram was sent from France in July. My reports—I do not remember the dates of any particular memoranda, but I know this, that immediately after I returned to this city, about the 2d or 3d day of September, we had nightly conferences up to 1 or 2 o'clock every night; that is, Col. Deeds, Col. Waldon, Col. Montgomery, Maj. Horner, Maj. Vincent, and Capt. Marmon and myself, and these recommendations were discussed back and forth during that period. It is my belief that the placing of the order for the Spads took place probably in the middle of September. I could not be sure of that, however.

Senator FRELINGHUYSEN. Is the Spad still a good single-seater fighter and in use on the western front?

Col. CLARK. It is in use on the western front, and it is doing good work, although it is not the best in the world to-day.

Senator FRELINGHUYSEN. It has not become obsolete?

Col. CLARK. Not obsolete as compared with the machines that our flyers at the front are using to-day. Except in one case, our flyers are flying machines that are absolutely obsolete.

Senator FRELINGHUYSEN. Do you know why the order for 3,000 Spads was canceled?

Col. CLARK. I was told that it was due to a cablegram from France recommending that we build no single seaters in this country. However, I was never able to locate that cablegram, and I know that officers who have gone over there have made efforts to locate the source of such a cablegram, and they can not find out from where it emanated.

Senator FRELINGHUYSEN. Did you make a report on the S. E. 5, an English single-seater machine?

Col. CLARK. Yes, sir; that was included in my reports. However, I did not consider the S. E. 5 as good as the Martinsyde.

Senator FRELINGHUYSEN. Is the S. E. 5 now being used on the western front?

Col. CLARK. Yes, sir; and I understand very successfully.

Senator FRELINGHUYSEN. More successfully than the Spad?

Col. CLARK. I think that is largely a matter of opinion. I do not believe that any Frenchman will admit that, sir. I do not know of any American flyers who have flown both machines, so it is very difficult to make the comparison. I will say, though, in my opinion, after looking at the interior construction of both machines, that the S. E. 5 is probably a little superior from a military standpoint, but not enough superior to warrant building it in view of the increased difficulties in production.

Senator FRELINGHUYSEN. What are those increased difficulties as against the Spad?

Col. CLARK. The fittings and the wooden parts are harder to build.

Senator FRELINGHUYSEN. In other words, if your recommendations had been complied with, we would have had a large number of Spad single-seater fighters at the front, whereas we have not now?

Col. CLARK. Yes, sir; and we would have had Capronis and Martinsydes and Bristol fighters and De Haviland 9's.

Senator FRELINGHUYSEN. Where would we have procured the engines for the single-seater fighters that you recommended, and for the two-seated machines?

Col. CLARK. The Spad that I recommended uses the 180-horsepower Hispano-Suiza engine, which was being built at that time and is now being built in this country in rather good quantity, I understand, at New Brunswick, N. J. The two-seaters would take the Liberty 12; that is, the De Haviland 9 and the Bristol fighter. The Liberty 8 would have been better adapted to the De Haviland for observation, but we were not able to build them at that time. We anticipated enough trouble in turning out one type of engine, to say nothing of two. I assumed that the only chance we had of getting engines was the Liberty 12.

The CHAIRMAN. For the Spad?

Col. CLARK. No, sir. For that, the 180-horsepower Hispano-Suiza.

Senator FRELINGHUYSEN. Do you know Col. Horner?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. Is he an engineer?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. What position does he now occupy?

Col. CLARK. I do not know. The last time I was around the production section he was a sort of executive to handle routine matters for Mr. Potter.

Senator FRELINGHUYSEN. Has he any say in the policy of the Aircraft Production Board at the present time?

Col. CLARK. That I do not know, sir.

Senator NEW. Can you offer any suggestion for bettering our system of airplane production?

Col. CLARK. Yes, sir; I can make suggestions. In the first place, I believe—it will not do any good to make this suggestion—that the business of having one head as a director of military aeronautics and another head as director of aircraft production, each man to all intents and purposes equally powerful, and with no direct head for all the air service over the two of them, is fundamentally unsound. I do not know how it is ever going to work successfully. I do not believe it has ever worked in any organization. In the case of a dispute between these two heads, I do not know who is going to settle the dispute. That is basic, and I probably should not criticize the organization from that standpoint, but even with the organization as it stands I believe that considerable improvement can be made by adopting the system of having under the director of military aeronautics a board—I am speaking now purely of constructing service aircraft and not about training or operation—having under the director of military aeronautics a board of, say, five officers. The president of that board should be permanent and the secretary permanent. The president of this board should be a man picked for his good, general working knowledge of airplanes and their use, and should be a man of mature judgment. The secretary should be permanent and should be a qualified, educated, and experienced aeronautical engineer.

The other three members of that board should be changed at different periods, say, every four months. They should always be men who have come directly from the front where they have been actually flying, and should be chosen from amongst the flyers at the front as those whose judgment of the airplane types to be selected would be the best. That board should make the recommendations concerning the types selected to be built, and on the military specifications for new types. The recommendations of that board should be adhered to to the letter, and should never be changed by the production people. That board makes its recommendations to the director of military aeronautics and the director of military aeronautics submits from time to time requests for types to be built, to the Bureau of Aircraft Production. In submitting these requests he makes no effort to submit engineering data or design drawings or anything of that character. He merely asks that a machine be built as nearly as possible to a certain European type which has been selected. He should describe for this machine the military characteristics which are essential, such as fields of fire for the guns, the number of guns, the disposition of the guns, the number of rounds of ammunition, the fields of vision, the factors of safety, the high speed at the altitude at which they expect to work, the rate of climb, the ceiling, and things like that, making no attempt to solve any engineering problems connected with working out how the desired result is to be accomplished.

This is turned over to the director of aircraft production, and the director of military aeronautics ceases to have anything to do with it until the director of aircraft production turns back to the director of military aeronautics a certain number, say, three experimental machines that he has built over here entirely from designs that came from the aircraft production board. Then a testing section under the director of military aeronautics tests out these machines—makes sand-load tests to determine the strength and flies them to test their controllability and stability and to ascertain whether or not the required attributes—high speed, climb, ceiling, the characteristics of vision and gunfire, etc., have been met. If the machine is satisfactory, the director of military aeronautics makes requisition on the bureau of production for a certain number of machines, and the machines built must be exactly like the machines which were submitted. Production is not permitted to make any changes which will change the military attributes of that machine.

Senator FRELINGHUYSEN. In other words, at the present time there are too many cooks, and they spoil the broth.

Col. CLARK. Yes, sir; there are hundreds of cooks. There is, as I am told, scarcely an officer in the production department that is not qualified to go out in the field and give an order.

Senator FRELINGHUYSEN. Do you think it is a wise policy to have men in control of production who are interested in the manufacturing of the product?

Col. CLARK. I do not believe I am qualified to speak on that point. It is beyond my experience, but it seems to me that complications certainly might arise that would be pretty bad.

Senator FRELINGHUYSEN. Might that not be the seat of the trouble?

Col. CLARK. Do you mean the seat of the present trouble?

Senator FRELINGHUYSEN. Yes.

Col. CLARK. I do not believe that it is. I do not know, but I do not believe that has anything to do with it.

The CHAIRMAN. What is your opinion of the SVA machine, the Italian fighter?

Col. CLARK. I think it is a very good single-seater. There are a number of reasons why I would rather see the Sopwith Dolphin or the Martinsyde rather than the SVA. There are two primary reasons. First, the method of wing trussing is such as to almost prohibit the possibility of adjusting the angles of the wings to the wind and to each other to correct any slight errors in workmanship or due to warped materials. The wing trussing is absolutely rigid; there are no wires, and you can not change the distance between any two points by means of turnbuckles. What does this mean? In the first place, our inspection is rotten. Our workmanship is not accurate. After only a mediocre inspection our planes are shipped, and they wait on the dock where the wood will become more or less warped, and they may have to wait in the hold of the ship, and then they wait on the other side on the dock, which means that the wood in parts may become warped, and then they are absolutely worthless, because you can not adjust those distances. Those are the fundamental reasons why the SVA is not as good for us as for the Italians. It has not been developed to a sufficient point as regards machine guns, etc. The machine guns are not now placed so that they can be worked from the pilot's seat.

The CHAIRMAN. Is it not a fact that it is necessary to design planes for engines?

Col. CLARK Absolutely.

The CHAIRMAN. And that one of the developments that we must make before the Liberty engine can be used for the latter types of machines is the designing of a plane for it?

Col. CLARK. Yes, sir.

The CHAIRMAN. Apart from your effort in that direction, do you know of any other engines that have been attempted?

Col. CLARK. Yes, sir; I spoke of Capt. Le Pere's machine, which was very much the same as mine—the same general arrangement as mine—and intended for the same military purposes. I consider his machine better than mine.

The CHAIRMAN. Were those designs of Capt. Le Pere and yourself made at the direction of the production board or as the result of your own voluntary action?

Col. CLARK. They were made by the direction of Col. Deeds.

The CHAIRMAN. Were either of them ever accepted?

Col. CLARK. Mine certainly was not accepted. About Capt. Le Pere's I do not know. I believe the machine is still being tested.

The CHAIRMAN. Where?

Col. CLARK. At either McCook Field or the Wilbur Wright Field. I do not know.

The CHAIRMAN. Were any others, besides yourself, relieved of duty at the McCook Field when you were relieved, or were you the only officer relieved at that time?

Col. CLARK. As nearly as I can remember, I was the only officer who was relieved. I told you that I had heard through round-about channels that the authorities had intimated, if not stated right out, that I had been a failure as commanding officer at the McCook Field. I have never been given any chance to defend myself along that line, and I believe that if an investigation by the military authorities could be made, in which the opinions of the heads of all departments then at McCook Field and now at McCook Field could be obtained, that I would be more or less vindicated.

The CHAIRMAN. Was any such reason assigned for your removal at the time you were removed?

Col. CLARK. No. I have told you of the only reason which was given.

Senator FRELINGHUYSEN. Did you have any differences with any of the officials of the Dayton Wright Co. or any of the other concerns manufacturing equipment in Dayton during your term of service?

Col. CLARK. I started to make some criticisms about what I considered the salient weak points in the construction of the De Havilland 4 as it was being built at the Dayton-Wright, but I was not permitted to make any suggestions after I had made one or two.

The CHAIRMAN. To whom did you make the one or two suggestions?

Col. CLARK. Mr. Kettering and Mr. Schoonmaker, who were the two engineers out there.

The CHAIRMAN. How soon afterwards were you relieved from duty out there?

Col. CLARK. I should say about a month after.

The CHAIRMAN. Colonel, you have shown me a copy of what purports to be extracts from a diary and report concerning the construction of the Bristol fighter, redesigned by yourself for the Liberty motor, direct-drive, 12-cylinder engine, the diary and report being those of Mr. J. D. Perrin, to whom you referred. Have you a copy that is free from your notes and interlineations?

Col. CLARK. Not with me.

The CHAIRMAN. Can you make a copy without that?

Col. CLARK. Yes, sir.

The CHAIRMAN. Will you please add it to your statement?

Col. CLARK. Yes, sir.

(The document referred to is here printed in full, as follows:)

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
Washington.

Extracts from diary and report concerning design and construction of Bristol Fighter airplane (U. S. A.-0-1), redesigned by Lieut. Col. V. E. Clark for the Liberty direct-drive, 12-cylinder engine; military function Army or corps observation. Airplane designed for artillery-fire control, photographic over tactical areas, and to have speed and armament such as to be able to take care of itself when attacked.

Mr. J. G. Perrin, who has kept the record quoted below, knows more about the history of the attempt at development of this airplane than any other man. He assisted in the preliminary redesign by Lieut. Col. Clark, and was afterward assigned to live in the Curtiss factory, to advise and assist the Curtiss engineering force in the development of this machine.

Below are exact extracts from Mr. Perrin's notes:

"NOTES ON BRISTOL HISTORY.

"Bristol aeroplane, selected by committee sent abroad to pick the best type to produce, arrived in Washington about September 1, 1917. Was placed in Airplane Exhibition Building, Smithsonian Institute Grounds, and draftsmen of the plane design section, Equipment Division, Lieut. Col. Clark in charge, were set to work making drawings of same, assisted by set of British drawings from factory which produced the machine.

"The fuselage of this machine was arranged for 190-horsepower Rolls-Royce engine, and the American reproduction was to carry a Liberty 12.

"Due to the increase in weight ($800-615=185$ pounds) and length of engine and carrying forward of the center of gravity, the whole engine-supporting structure had to be changed, and the wing location and length of chord likewise, to get increased wing area and to move the center pressure forward to agree with new center of gravity.

"(a) At first there were only about three or four draftsmen working in the Airplane Exhibition Building and about five on fifth floor of old Southern Railroad Building, at 119 D Street SE. About October 1 Col. Clark and all his draftsmen were concentrated at the Air Exhibition Building and men were brought in from Detroit and other places, until there were very near 35 or 40 men working in copying the Bristol plane.

"About October 15 the best and only real practical airplane designer (Douglas) left to join the Glenn-Martin Co., of Cleveland, Ohio. It was a mistake to let this man go, as Col. Clark was away so much in conference that the work suffered considerably from lack of direction by men with expert airplane-design experience. The man in direct charge of redesign (Riche) was not a practical designer, although he had a good theoretical education.

NOTE.—Douglas left because he was unwilling to work with Col. Vincent.

"During October work in this building, which was really only a sheet-iron hangar, was seriously handicapped by cold weather, so temporary relief was obtained by curtaining off half the building and putting in oil stoves and gas heaters. In view of contemplated early move of all this work to Dayton, effort was made to put up with these unfavorable working conditions for the short time remaining.

"In the meantime, it had been decided to have the Curtiss Co. manufacture the Bristol, and sample machine was shipped to Curtiss Co. by express on a special flat car, November 1, 1917.

"Before drawings were finished, Col. Clark's department was moved to Dayton, Ohio (about Nov. 8).

"(b) Before drawings were finished November 6, Col. Clark's department (now known as Airplane Engineering Department) was moved to Dayton, Ohio, and took up temporary quarters in the Lindsey Building, as McCook Field buildings were not yet ready. This move interrupted the work to the extent of over a week's delay.

"Another interruption in the work resulted from the move to McCook Field, about three weeks later.

"(c) November 17 a large batch of prints was sent to Curtiss Co. by special messenger (some had been sent by mail previously), with the understanding that as soon as enough data was available, a sample machine was to be built, to check up the changes that had been made in the original machine, and after this had been worked out satisfactorily the Curtiss Co. would put same in production—2,000 were ordered.

* * * * *

"Another large batch of prints taken to Curtiss Co.—Conference Schwable, Weber, Mueller, and Perrin. They stated they would put drawings in shop to construct sample machine. Their chief draftsman (Hoffman) after looking over prints received this date stated they had enough to start sample machine.

* * * * *

"DECEMBER 7.

"Maj. Shepler, Mueller, Perrin in conference at Curtiss Co. Wrote Clark that Mueller stated would agree to have Bristol sample completed three weeks after receiving Liberty engine, as wanted to have engine in shop before going too far with drawings.

* * * * *

"JANUARY 9.

"Col. Deeds et al. here said Bristol was very successful type we were copying. Said Liberty engine production would be ahead of plane production.

"JANUARY 11.

"Last batch of prints (850 in all) and complete parts lists brought from Dayton.

"(d) Covering all essential details for a flying model except spark and throttle controls and military equipment, which was undecided, but unnecessary for flying model. It was understood that the Curtiss Co. would have to finish the comparatively few details to complete a flying model and rush the production of one to check Signal Corps drawings and from which complete working drawings would be made. Some draftsmen's errors were discovered which were made much of by Curtiss Co., but when machines were subsequently started from Curtiss drawings just as many mistakes showed up and it required the production of several machines to prove up and correct Curtiss production drawings.

* * * * *

"JANUARY 27.

"Conference was held by the Government and Curtiss representatives around the sample machine, which was complete as far as skeleton structure was concerned. Thirty-five changes in construction were approved by Green and Butts, many of which were unnecessary and only gave Curtiss Co. alibis for delay in getting into production.

"FEBRUARY 1.

"Maj. Shepler designated Mueller chief engineer of Curtiss Co. to take charge of Bristol design and other airplane work Curtiss was doing. Confirmed by Maj. Grat, February 5.

* * * * *

" FEBRUARY 9.

" In eight days first three production machines have hardly progressed, due to errors in construction and change in engine-supporting structure made by Curtiss Co. While it was definitely understood that one of the purposes in building sample machine was to check up Signal Corps drawings and to show where new drawings were necessary to cover all parts, yet Curtiss Co. managed so poorly that complete drawing information was still lacking when 25 machines were put into production.

" FEBRUARY 13.

"-Col. Walden here stated that Bristol construction and design was very satisfactory at front.

" FEBRUARY 14.

" Protested to Green of slowness on completion of sample machine and repeated previous complaints about not having a concentrated shop or organization to build sample machines.

* * * * *

" FEBRUARY 27.

" Changed number of fuselage bracing wires, although Curtiss had checked up stress analysis January 4 and made what changes they considered necessary.

" FEBRUARY 28.

" Fitted wings and tried out engine during night. Had trouble aligning tail surfaces due to poor workmanship, although heavier tubing was used than in original Bristol.

" MARCH 1.

" Weight flying model in shop.

" The Bristol machine (U. S. A. 01) as originally released to the Curtiss Co. by Col. Clark has a calculated weight of 2,937 pounds and included the following equipment: Liberty engine, two men, fuel, oil, water, Marlin gun and 800 rounds, Lewis gun and mount and 970 rounds----- 2, 937

" Machines as built by the Curtiss Co., with the above equipment, as weighed on the floor ready for flight----- 3, 146

" Difference in weight being due to possible errors in calculation of weight and to larger radiators and other heavier parts added by Curtiss Co. in change of design in details.

" Bristol as now planned includes the following extra equipment:

Extra Marlin gun-----	23. 5
200 additional rounds-----	13. 5
Extra Lewis gun-----	17
Additional weight of mounting of two guns and changes in construction (estimated)-----	15
Camera (changes type—10 focus), 8 extra mag and plates; total, 72 plates-----	54
Radio-----	82
Bombing outfit (10 23 each), racks, actuating device-----	283
Flares for night landing-----	6
Very pistol and cartridges-----	6
Oxygen tanks (2) and distribution box-----	26

Additional weight over original design-----	525
	<u>3, 146</u>

Total weight as now planned-----	<u><u>3, 671</u></u>
----------------------------------	----------------------

" I am confident when the regular Curtiss production comes through a machine with full equipment will weigh well over 3,700 pounds.

"Took wings off to send machine to field and found two wing beams ruined, where holes for hinge pins had been drilled off, necessitating whole new wings.

" MARCH 2.

"Took machine to flying field. Wings were damaged during trip to field. Patched up.

* * * * *

" MARCH 4.

"Couldn't get engine to run without much effort. Weather very cold. Oil leads not right so oil came out of vent. No heat in hangar, no telephone, no spare parts or portable tools; any drilling had to be done by hand. Flying field in very primitive condition.

" MARCH 5.

"Maj. Smith took machine out, broke tail skid in taking over rough field. After this was patched up took another run, and although engine was missing badly, due to sooted spark plugs, machine flew about five minutes. Had to come down account of engine trouble, and in landing, landing gear was broken. Tubular struts were too light, but tubing was found to be only 8 point carbon. Machine not flown again until March 22—excuses advanced, either bad weather, bad field, or no pilots.

" MARCH 11.

"Maj. Hall here with apparently full information regarding equipment to finish up the Bristol and the actual equipment itself. Discarded Capt. Foreman's double-gun mount and made other extensive changes and additions. Started a model machine to be complete in every particular. At this date about 1,402 Curtiss drawings had been released for production. Nine hundred and ninety-five Vandykes had been sent to Dayton for spare parts manufacturers, balance of drawings being retraced to get better Vandykes. With changes Maj. Hall outlines and change in wing-rub construction wanted by Curtiss, about half these drawings will be obsolete and new ones necessary.

" MARCH 12.

"Curtiss Co. finally set aside an experimental job shop for the Bristol which should have been done two months before.

" MARCH 22.

"Bristol given second flight by Lieut. Col. Jones. Flew about 15 minutes with a broken blade on propeller caused by picking up mud in getting off ground.

" MARCH 24.

"Bristol flew near an hour—10,000 feet altitude. Maximum speed on trip 121½—side wind.

" MARCH 28.

"Machine at field caught fire and badly damaged.

" MARCH 30.

"Maj. Hall gave Curtiss Co. go ahead on all changes to bring drawings up to model fully equipped machines. Understand this applies to 400 machines.

"APRIL 5.

"Took new machine to field to replace burnt machine. This was fitted with center-panel radiator, which has taken three months to bring to a point of trial

Flying trials have been so long delayed, however, that two machines will be necessary to work out radiator problem, together with other problems, which it would take too long to depend on one flying model. First lot of 25 fuselages being changed to conform to Maj. Hall's model.

"FEATURES OF DELAY IN CURTISS CO. IN NOT GETTING RESULTS OUT OF M. ELLWOOD FACTORY.

"Delay and lack of ability in whipping new organization into shape.

"Elaborate factory system, with enormous overhead.

"Antipathy to Bristol design and an attitude leading to the suspicion of a desire to make the Bristol a failure, so a Curtiss machine would have to be resorted to.

"Lack of speed and concentration in the production of a sample machine to prepare for straight-ahead production.

"Attempting to make sample machine in immense shop instead of a segregated and self-contained department, where work could be watched and rushed to better advantage. This was finally started on March 11, but not fully equipped for a month later.

"Constant effort to change from tried-out Bristol principles of design and to inject changes of construction to cover careless workmanship or poor material.

"Lack of cooperation to complete Signal Corps drawings which were admittedly incomplete, but instead holding to an attitude of showing up incompleteness of same.

"Inexcusable lack of foresight in not arranging for a flying field alongside of new factory. No attempt made to put the field they had (5 miles away from factory) in shape for the test flights they should have foreseen would be necessary. No heat in hangars, no telephone (until Mar. 12), no light for night work, no spare parts, no tools, no concentrated and specially trained organization, and no pilots (until a late date, and he was inexperienced on high-speed machines).

"No concentrated, experienced, or inventive engineering ability in perfecting undeveloped features of design incidental to change of engine. After four months of warning no radiator has been developed as satisfactory for wide-ride radiators. All changes in design have been very crude."

The CHAIRMAN. What have been your duties, if any, since you were called from the McCook field and ordered to report here in Washington?

Col. CLARK. I was ordered first to Washington and then around to airplane factories at Elizabeth, Detroit, and so forth. I was sent once to Indianapolis, ordered down to Langley field, and then ordered on a trip around the country which covered almost all of our schools. The published purpose of this trip was to submit reports to Col. Deeds embodying constructive criticisms of the supply and equipment system. Then I was sent down to Camp Morrison, an aviation concentration camp down in Virginia, where we have about 5,000 men and two hundred and eighty some officers. When I had been down there a short time I was placed in command of Camp Morrison. I have been here in Washington for about 10 days.

The CHAIRMAN. You referred to Langley field in your last answer. Are you familiar with that field?

Col. CLARK. Yes, sir; I am the man who started Langley field.

The CHAIRMAN. Were you engaged there when the testing equipment and activities were transferred from the McCook field?

Col. CLARK. No, sir; I was here in Washington. I went from Washington to McCook field and was there during its construction.

The CHAIRMAN. From your knowledge of the two fields, the Langley and the McCook fields, which, in your judgment, is better adapted to the purpose for which the McCook field is being used?

Col. CLARK. For work in war time McCook field is a great deal better adapted. For peace-time work Langley field is better.

The CHAIRMAN. Do you consider the McCook field large enough for the purposes and well suited for them?

Col. CLARK. No, sir; I do not think that the field itself is as large as might be desirable. However, I think that the controlling factor in the location of any field like a governmental experiment field, such as the McCook field is, should be availability to expert labor and to material, and for that reason I think you have to be very close to some manufacturing city such as Dayton.

The CHAIRMAN. You could find such a city nearer a seaport?

Col. CLARK. Yes, sir; and we could have used Cleveland, Indianapolis, Buffalo, or Detroit.

The CHAIRMAN. None of those, except Buffalo, are near a seaport?

Col. CLARK. No, sir.

Senator NEW. Colonel, we are very much obliged to you for this information.

Col. CLARK. There is another thing here that I would like to speak about. Here is a letter that I believe is on record in the War Department, written by Mr. Perrin to Maj. Gray, that touches on certain conditions in the Curtiss factory during the development of the Bristol fighter.

The CHAIRMAN. Who was Maj. Gray?

Col. CLARK. He was at one time in charge of production engineering. He has since resigned, I believe.

The CHAIRMAN. Colonel, you have just shown me two letters and a telegram which passed between Maj. B. D. Gray and Mr. J. G. Perrin. Is that the same Mr. Perrin from whose diary and report you have made certain extracts, already referred to?

Col. CLARK. Yes, sir.

The CHAIRMAN. Would it be convenient to put those in the record as a part of your testimony?

Col. CLARK. Yes, sir.

(Letters and telegram referred to are here printed in full. as follows:)

BUFFALO, N. Y., March 12, 1918.

Maj. B. D. GRAY.

Production Engineering Department.

Dayton, Ohio.

DEAR SIR: I trust this finds you in Dayton, as I consider the points covered justify consideration and action.

I wonder if you know that the Bristol, to my knowledge, has not been flown again up to Tuesday night since the night you saw the landing gear broken—5th. I know of no earthly reason why a new landing gear could not have been fitted and the machine flown by Thursday, the 7th. There is no bad-weather excuse, as both Thursday and Friday had good flying periods. As regards a pilot, the Curtiss Co. should have arranged for a Government pilot if their own was not available, so that excuse would not pass investigation. Their man Rolfs did not show up at the factory until Monday, the 11th. This is a fair example of the lack of foresight and preparedness the Curtiss Co. has shown throughout this Bristol work.

Mueller must have known that their flying field would have to do considerable cold-weather work, yet there has been no telephone there or any heat or light in their hangars for emergency night work.

While there have been Government changes in gun mounts, etc., and some information relating to accessories has been late in arriving, yet there is no reason for not going ahead vigorously and testing out the essential flying features of the machine just as it is to see if it is fundamentally all right independent of the accessories. In my opinion that machine should be kept in

the air just as much as possible; there should be two pilots always available and the flying field should immediately be fitted up for doing night work (fitting and adjusting), an automobile for towing always available, and quick means of communication with the factory for getting supplies and parts. A good engineman should be secured who understands the Liberty engine. I certainly believe that the importance of the work justifies preparation so that this trial work is not held up one minute.

Maj. Hall arrived Monday, the 11th, and is changing the double gun mount from the way Mueller and Capt. Forman had it made. They have at last arranged for a separate department to do this work, but have taken a room in a new building which is not entirely finished, so there will be a few days working at a disadvantage.

Now that we have practically all the information regarding the military requirements of the Bristol, I have compiled the following data, which leads to some disturbing conclusions and, in my opinion, some readjustment in the airplane program:

The Bristol machine (U. S. A. 0-1) as originally released to the Curtiss Co. by Col. Clark had a calculated weight of 2,937 pounds, and included the following equipment: Liberty engine, 2 men, fuel, oil, water, Marlin gun and 800 rounds, Lewis gun and mount and 970 rounds -----	2,937
Machine as built by the Curtiss Co., with the above equipment, as weighed on the floor ready for flight-----	3,146

Difference in weight being due to possible errors in calculation of weight and to larger radiators and other heavier parts added by Curtiss Co. in change of design in details.

Bristol as now planned includes the following extra equipment:

Extra Marlin gun -----	23.5
200 additional rounds-----	13.5
Extra Lewis gun -----	17
Additional weight of mounting of 2 guns and changes in construction (estimate)-----	15
Camera ("L" type, 10 focus), 2 extra magazines, and plates, total of 72 plates-----	54
Radio:	
Bombing outfit (1,023 each), racks, actuating device-----	283
Flares for night landing-----	6
Very pistol and cartridges-----	6
Oxygen tanks (2) and distributing box-----	25
	<hr/>
Additional weight over original design-----	525
	3,146
	<hr/>
Total weight as now planned-----	3,671

I am confident when the regular Curtiss production comes through a machine with full equipment will weigh well over 3,700 pounds.

And the camera people want the Bristol arranged so it is possible to install camera with 20-inch focal length.

Now, I assume that it is not planned to use all this equipment simultaneously, but with any probable working combination this machine will be greatly overloaded to get proper performance and for the carrying capacity of some of the structure. The landing gear will certainly have to be redesigned.

The supporting surfaces of the Bristol figure out at 450 square feet (wings, 405.5; tail surfaces, 45.5) and, with a weight of 3,700 pounds, we have a surface loading of $\frac{3700}{450} = 8.25$ pounds per square foot. Now, the Spad, which is

a fast scout machine, only has a surface loading of 7.3, and the original Bristol, with a 190-horsepower Rolls-Royce engine, 6.4, and the British De H. 4 had 6.1.

Figuring wing areas only, which is sometimes a method of comparison we have $\frac{3700}{405} = 9.2$ pounds per square foot.

I do not have the proportions of the Dayton-Wright De H. 4, but I should think they must be up against the same problem.

There may be some angles of the program that I am not posted on, but it certainly seems to me the only way to get under way quickly and to simplify the production is to build a machine for a particular service and concentrate

on that. For instance, the De H. 4 could be a bomber (the Bristol is certainly not adapted for bombing) and the Bristol a fighter and observation plane. For photographic work it certainly appears as if the large camera would be more effective, but a plane would have to be assigned to this special work for structural reasons and the matter of balance. If this has to be accomplished at the sacrifice of its offensive or defensive ability, such a machine might have to be convoyed by fighting planes.

You may be already aware of the Bristol situation as affected by weight of equipment, as I have spoken of it around here, but I do not see any decision for handling the proposition such as I have outlined.

I should have stated above that the machine you saw in flight Tuesday, March 5, and which Maj. Smith judged O. K. as regards balance, had no equipment, such as guns or accessories, so that the weight was less than 3,000 pounds.

I am working with Lieberman to get the weight per unit of area of the various coats of finishing material used to paint the Bristol parts, but it will be several days before this can be completed in the way it would seem necessary it should be done to incorporate in specifications.

I would appreciate an order from you to the Curtiss Co., directing them to give me a pass to the flying field and to give me an opportunity to see all that is going on in their experimental department on Bristol work.

I believe the above facts regarding the Bristol should be given grave consideration.

Sincerely, yours,

J. G. PERRIN.

WAR DEPARTMENT,
PRODUCTION ENGINEERING DEPARTMENT,
SIGNAL CORPS, UNITED STATES ARMY.
Dayton, Ohio, March 14, 1918.

From: Production Engineering Department.

To: Mr. J. G. Perrin, care of Curtiss Aeroplane & Motor Corp., Buffalo, N. Y.

Subject: Bristol situation.

1. Your telegram and letter of the 12th, relative to the Bristol situation, has been received. It is regrettable that nothing has been done in the way of flying this machine since I was there on Tuesday, the 5th, but I understand from Maj. Hall that the weather has not been suitable and, in his judgment, the reluctance on the part of the pilots to fly under unfavorable conditions a practically untried machine is justifiable.

2. Certainly this machine should be put in flying condition at the earliest possible moment and kept in the air as much as possible. Your suggestions relative to night work, if this should be necessary, are good.

3. We have decided to have the D H 4 landing gear applied, with such modifications as may be necessary, and a satisfactory type of tail skid. Maj. Hall is arranging for these matters. There will be nothing done to the 20-inch focal length camera for the present.

4. The question of military equipment is decided to a large degree by the requirements abroad and we are obliged to meet their desires wherever possible.

5. The figures you are getting are very interesting. I think that Mr. Green should be able to get you a pass to the flying field. If not, Maj. Hall will arrange for that. I am turning your letter over to Maj. Hall, with the request that he go into the matter more in detail.

By direction of the Chief Signal Officer of the Army.

B. D. GRAY,
Major, Sig. R. C. A. S.

Copy to Maj. Hall.

[Night letter, prepaid.]

BUFFALO, March 13, 1918.

Maj. GRAY,

Production Engineering Dept.,

Lindsey Building, Dayton, Ohio.

Mueller has not yet given machine second test. Hear excuses, but no man-size reason for delay. Have had plenty of good weather, but raining to-night. If field too soft, why not build wooden landing platform? Consider inaction and inability to cope with situation positively criminal. Also see letter mailed this Wednesday morning.

J. G. PERRIN.

(Col. Clark submitted for the record the following report:)

SEPTEMBER 12, 1917.

Memorandum for Chief Signal Officer of the Army:

I submit the following report on the present status of military airplanes along the western front, with suggestions regarding probable future development. The primary purpose of this report is to set down the general requirements for military airplanes as determined by military necessity, in such a way that those officers held responsible for the production and supply of airplanes may appreciate clearly the viewpoint of the man in the field. It must be expected that two very strong factors, viz.: 1. The man operating the field, and 2. inventors and designers of aircraft, will continually argue toward a great number of types of machines. The man in the field will demand many types partly because (very naturally, when fighting an efficient foe) he is never satisfied with any equipment except the latest and therefore the best, and partly because he wants, for any particular mission, an airplane which has been designed especially for such mission. He is loathe to accept a machine of obsolescent type, or one which is a compromise with a view to endeavoring to perform several functions. The pilot is usually inexperienced in factory methods, and consequently is not acquainted with the great difficulties in trying to produce machines in large quantities by modern factory methods, when the design is being continually changed with a view to improving the machine. On the other hand it is entirely possible that the man (safe on the ground back home) who is endeavoring to produce machines in large quantities is liable, in the stress of work, to forget the viewpoint of the men in the field, who must use the product in the most strenuous kind of service known to history.

In general, the functions of airplanes in modern warfare along the western front are:

1. To help the Army on the ground in successfully performing its operations.
2. To prevent enemy aircraft from doing damage in any way.
3. To inflict direct damage upon the enemy.

We may call the type which is designated to perform functions under the heading 1. Army observation airplanes. These machines are held responsible for the performance of the following functions:

Fire control and artillery, firing against enemy batteries, against enemy strong points near the line, and against enemy infantry in trenches, especially at trench junctions.

Photography of all territory in the vicinity of the line, of the enemy's territory beyond the line as far as may be required, especial attention being paid to objects and sections of territory of particular military interest.

Contact patrol for friendly infantry movements, with the view to keeping grand commanders and covering artillery (especially barrage) commanders informed of the position of the advancing or retiring line during its movement.

General tactical reconnaissance by staff officers.

Rapid transportation of staff officers, and rapid communication of important messages.

The number of Army observation airplanes built and originally supplied will depend upon the strength of the Army on the ground, the amount and character of the work being performed by friendly artillery and infantry, and the general plan of campaign. The number which it will be necessary to supply for replacement will depend upon the degree of effectiveness of the enemy's activities against our Army observation machines, the amount and character of training which our pilots will have undergone, the character of the country over which the machines are flown, and the reliability of the machine itself, as a complete unit.

The primary requirements for this type of airplane in order that it may effectively perform its military functions are:

Provision of effective observation of the ground, by eye and by camera.

Provision for transmitting messages quickly, reliably, and accurately to friendly stations on the ground.

The performance, armament, and maneuvering ability of the airplane should be such that, in the hands of a pilot of ordinary ability, it would stand a good chance in fighting any hostile airplanes.

Two men will be carried. The pilot, who sits in front, should be the observer, and should operate the wireless key, or the camera, and must operate the gun that fires to the front. The second man sits close in rear of the pilot in order that he may communicate readily with him, and is held responsible for the protection of the airplane against attack by hostile aircraft, from above, the rear, or either side. He will be provided with one or two machine guns for this purpose.

If the machine is sent out for the purpose of artillery fire control it is equipped with a wireless transmitting set.

The military load, which includes two men, armament, instruments, and either a wireless set, or a camera, will weigh about 240 kilograms (528 pounds).

It should be capable of flying continuously at about 90 per cent of its maximum speed, for a distance of about 530 kilometers (330 miles).

The wing loading, with full load carried, should not be more than 31.5 kilograms per square meter (6.45 pounds per square foot). The weight in kilograms of the complete airplane loaded should not be more than 5.5 times the number of horsepower developed at 3,000 meters altitude. The ceiling with full military load should not be less than 5,500 meters. The factor of safety of the main plane structure should be not less than six and one-half for high incidence condition, and four and one-half for low incidence condition.

Starting with full load it should be able to climb to an altitude of 3,000 meters in not over 11 minutes, and should have possible horizontal speed of not less than 185 kilometers per hour at that altitude.

PROPER POWER PLANT.

Assuming: Weight of airplane loaded, 31.5 kilograms per square meter; military load 240 kilograms; weight of gasoline and oil 0.738 kilograms per horsepower (which will permit a flight of about 530 kilometers; weight of power plant, including radiator and water:

Case I (with no device for maintaining constant power at all altitudes): 1.5 kilograms per horsepower at sea level, or 2.9 kilograms per horsepower at 3,000 meters altitude.

Case II (turbine for air intake, or other device for maintaining power constant at all altitudes): 1.6 kilograms per horsepower.

The ideal power with assumptions as above would be:

Case I: 365 to 385 at sea level; 250 to 265 at 3,000 meters altitude.

Case II: 260 to 280 horsepower.

Typical airplanes for Army observation are the Bristol Fighter (British), the S. I. A.-7B (Italian), and the Brequet-14 (French).

The German L. V. G., with the 235-horsepower Mercedes engine is typical.

It is believed that all of the functions required of an airplane for Army observation can be performed by one type, with the possible exception of special photography from a great height, well behind the lines, where a large heavy camera with great focal length lens is necessary, in order that details on the ground may be brought out satisfactorily. However, it is believed that such special photographic missions may be performed by an airplane of the day bomber type, discussed later, modified slightly for the purpose after arrival in the field.

The second grand division under functions is "to prevent enemy aircraft from doing damage in any way."

Airplanes designed for combat and pursuit will be held responsible not only for keeping enemy bombing airplanes on the far side of the line, but also for keeping enemy army observation airplanes from effectively performing their functions in helping the enemy ground army. From the standpoint of the defensive, the combat and the pursuit types must always protect friendly army observation airplanes from molestation by enemy aircraft in order that these airplanes may perform their functions without interference or interruption. The combat and pursuit airplanes may also be called upon to escort day bombers across, and for some distance beyond, the line. They must protect kite balloons from attack by hostile aircraft.

As strictly offensive weapons the broad function of combat and pursuit types is to drive all enemy aircraft out of the air, destroying them when possible.

The number of combat and pursuit machines built and supplied depends upon:

I. Should a weak and defensive policy be adopted, through choice or necessity, and the enemy granted the balance of power in the air, the number of combat and pursuit machines will depend upon the number of friendly army observation airplanes, kite balloons, etc., which must be protected from hostile aircraft.

II. On the other hand, assuming that we determine to obtain and maintain the balance of power in the air, and adopt an offensive policy, the number of combat and pursuit machines which should be built and supplied will depend upon the total number of airplanes built and used by the enemy, as, in this case, the campaign will be to drive the enemy out of the air through superiority in numbers of fighting airplanes.

I will differentiate between the combat and the pursuit types as, for the present at least, quite different characteristics are demanded. The combat type is the type needed for fighting in the air when both sides elect to "stay and fight it out." On the other hand, the pursuit type is necessary when one side or the other decides, for some reason, to "run for it." It will be shown that quite different characteristics for the two types are demanded.

For the combat machine the primary requirements, in order that it may effectively perform its military functions, are:

Good climbing ability.

A high degree of celerity of response to control, in other words, excellent maneuvering ability, or "handiness."

Power and reliable armament.

The machine must be capable of climbing well, and maneuvering without loss of altitude, at great altitudes. There should be still a considerable margin of power at an altitude of 6,000 meters.

The structural strength of the wing structure, tail structure, etc., must be great enough to permit and maneuver necessary in aerial combat.

The general characteristics of the airplane to fulfill its requirements are:

The fraction—

$$\frac{\text{total weight of airplane}}{\text{horsepower available at altitude of 6,000 meters}}$$

must be small.

The masses must be well concentrated, the moments of the inertia small, in order that the machine may be handy.

It will be seen that the general characteristics for the pursuit type are practically incompatible with these.

The primary requirements of the pursuit type are:

High speed while going "down hill." This applies to any angle of flight path from the horizontal to the vertical, as in a dive.

Powerful and reliable armament.

The possible horizontal high speed must be great at an altitude of 6,000 meters.

The structural strength must be great enough to permit a long dive and recovery.

The primary general characteristics of the airplane, in order that it may fulfill its requirements, are:

a. The fraction $\frac{\text{total resistance in low incidence condition}}{\text{total weight of airplane}}$ must be small.

b. The fraction $\frac{\text{total resistance under low incidence condition}}{\text{power available at 6,000 meters altitude}}$ must be small.

It is readily seen that this machine is quite different from the combat machine.

For instance, it would be fatal for a machine of the ~~handy~~, strong climbing, fighting type, to endeavor to run away from a machine of the fast pursuit type in case of a machine gun jamming or ammunition being exhausted. It would be overtaken and brought down invariably. Again, it could not hope to catch a machine of the pursuit type should the latter decide to run away. On the other hand, the pursuit type could not hope successfully to stand up and fight against the machine of the handy, climbing, combat type. I might suggest here that the abandonment of the fighting type in favor of the fast type by the Germans indicates the tendency in their aerial tactics. I mean that Germany has eventually to adopt the rule of running away unless they have great superiority in numbers of airplanes in any particular encounter.

At present the usual practice is for both types to be single seaters.

Discussing the combat type again, the best armament to date appears to be either three machine guns, two firing to the front through the propeller disk, and one flexible in a vertical plane with field of fire overhead; or one 37-millimeter or 47-millimeter cannon firing shrapnel filled with very large buckshot set to explode at a range of about 75 yards, firing through the propeller hub, and, possibly, in addition, one machine gun, flexible in a vertical plane, with field overhead.

The weight in kilograms of the complete airplane loaded should not be more than 4.5 times the number of horsepower developed at 6,000 meters altitude. The ceiling with full military load should not be less than 7,500 meters. The factor of safety of the main plane structure should be not less than 7 for high incidence condition and 5 for low incidence condition. Starting with full load, the combat machine should be able to climb to an altitude of 5,000 meters in 12 minutes, and should have possible horizontal speed of not less than 200 kilometers per hour at that altitude.

The wing loading should not be more than 30 kilograms per square meter (6.14 pounds per square foot). The military load, including three machine guns, is about 130 kilograms (287 pounds). A flight of about 360 kilometers (225 miles) at practically full power should be possible.

PROPER POWER.

With the above assumptions, and assuming a rotary air-cooled engine (in order to concentrate the masses) weighing 1.64 kilograms per horsepower at 6,000 meters altitude (0.77 kilograms per horsepower at sea level).

Weight of fuel and oil 0.66 kilograms per horsepower (1.45 pounds per horsepower) which will permit the flight duration above.

The ideal power should be from 160 to 180 horsepower at an altitude of 6,000 meters, or 345 to 375 horsepower at sea level.

On the basis of total loaded weight of airplane per horsepower available, the latest Gnome monosoupape, which develops about 77 horsepower at 6,000 meters (165 horsepower at sea level), is only 87 per cent as efficient for the purpose as the ideal engine. However, largely on account of the great handiness possible with this engine, it appears to be the best to date.

It must be remembered, however, that should some device, such as a turbine to give more air at the carbureter intake at high altitudes, be successfully developed, the rotary engine will be eliminated completely immediately, unless the device be of such character as to permit use with this type of engine. Any engine of fixed cylinder type which will weigh considerably less than 0.16 kilogram per horsepower developed at 6,000 meters' altitude will, of course, be better for the purpose.

Typical modern airplanes of the single seater fighting type are the latest Spad, with 165 horsepower Gnome, and the latest Sopwith, with the same engine. The Sopwith camel with the AR-1, 150-horsepower engine and the Nieuport with the Le Rhone 120 horsepower have given good service. Italy has no machine of this type. To the best of my knowledge Germany has abandoned this type of handy single-seater fighter. The last effort known was the old Fokker with the 100-horsepower Oberursel engine.

While I believe that at the present time it is necessary for us to build machines of the short-coupled, handy, single-seater fighter type, I believe that, owing to the inevitable necessity for abandoning the plan of independent machines (except those for Army observation and night bombing purposes) operating in the air, this type will soon be eliminated. I believe that very soon all fighting and day bombing excursions will be performed with a number of machines (probably in groups of 5 and multiples thereof) in formation. The effectiveness of the excursions will depend entirely upon the formation being preserved intact during all maneuvers. This will militate at once against the handy type as compared to the high-speed type. Of course, should the "constant power at altitude" device eliminate the rotary engine, this will be another cause for abandoning the handy type in favor of the high-speed type.

Taking up again the single-seater pursuit type:

At present this machine carries two machine guns, both firing through the propeller disk, or one cannon, as described above, firing through the propeller hub.

The military load is about 130 kilograms (287 pounds). The pursuit machine should be capable of flying continuously at little less than its maximum power for a distance of about 480 kilometers (300 miles). The wing loading with full load should not be more than 38.5 kilograms per square meter (7.88 pounds per square foot). The weight in kilograms of the complete airplane loaded should not be more than 5.5 times the number of horsepower developed at 6,000 meters' altitude. The ceiling, with full military load, should not be less than 7,500 meters. The factor of safety of the main plane structure should not be less than $6\frac{1}{2}$ for high incidence condition and $5\frac{1}{2}$ for low incidence condition.

Starting with full load it should be able to climb to an altitude of 5,000 meters in not over 16 minutes, and should have possible horizontal speed of not less than 220 kilometers per hour at that altitude.

With the above assumptions for the pursuit machine, and assuming: Weight of gasoline and oil 0.57 kilograms per horsepower (1.25 pounds per horsepower) which will permit the above flight radius; weight of power plant, including radiator and water:

Case I (no device for maintaining power constant at all altitudes). 2.88 kilograms per horsepower at 6,000 meters altitude (1.35 kilograms per horsepower at sea level).

Case II (turbine for air intake, or other device for maintaining power constant with change in altitude). 1.45 kilograms (3.2 pounds) per horsepower.

The ideal power would be:

Case I. 150 to 170 horsepower at 6,000 meters (325 to 350 horsepower at sea level).

Case II. 160 to 180 horsepower.

This indicates that, under the conditions assumed, the Hispano-Suiza 170 horsepower (at 1,630 revolutions per minute, high compression, direct drive) would be an ideal engine for the single seater pursuit if a device were installed to keep the power constant at all altitudes up to 6,000 meters. The high speed of propeller revolution, while a decided disadvantage, might be borne.

It is quite evident that this engine, with the constant power device installed, would be superior to the 165 horsepower Gnome, for all single-seater machines. If the constant power device were developed it would mean one less type of airplane necessary to build. A design would be required which constitute a compromise between the single-seater fighter and the single-seater pursuit.

Typical airplanes of the single-seater pursuit class are the Martinsyde (British) with the 275 horsepower Rolls-Royce, the S. V. A. (Italian) with the S. P. A. 210 horsepower engine, and the Spad (French) with the 220 horsepower Hispano-Suiza. The German Halberstadt, with the 120 horsepower Argus, and the Albatros III, are successful machines of this type.

I believe that, should a device be successfully developed to maintain power constant with changes in altitude (and I believe that the development of such a device is by far the most important problem connected with aviation material) this will mean an inevitable abandoning of all single seater military airplanes. I say this because, immediately the radial engine is abandoned, extreme handiness is lost, and the percentage of increase in longitudinal moment of inertia brought about by the addition of one more man will be comparatively small. Again, the ideal power, and hence the weight of the power plant, is so great that the percentage increase in total load weight of airplane caused by the addition on one man, becomes comparatively small. Again these increases in longitudinal moments of inertia and weight, must be considered the great advantage in having one more man to operate against the enemy to the sides and to the rear, and in reducing the number of types of airplanes which must be built at home and repaired in the field. As I have said, the tendency in aerial warfare is coming to be to fight in formation rather than by independent machines, and this tendency will eventually bring about the replacement of the single-seater type by the two seater.

IDEAL POWER FOR THE TWO SEATER PURSUIT TYPE.

Assumptions: Weight of airplane loaded, 38.5 kilograms per square meter (7.88 lbs. per square foot).

Military load, 225 kilograms (495 pounds).

Weight of gasoline and oil, 0.682 kilograms per horsepower (1.5 pounds per horsepower), which will permit a flight of about 564 kilometers (350 miles).

Weight of power plant including radiator and water:

Case I (no device for maintaining power constant with change in altitude). 2.53 kilograms per horsepower at 5,000 meters altitude (1.35 kilograms per horsepower at sea level).

Case II (turbine for air intake, or other device, for maintaining power constant at all altitudes). 1.45 kilograms per horsepower (3.2 pounds per horsepower).

The ideal case would be:

Case I. 220 to 235 horsepower at 5,000 meters, or 425 horsepower at sea level.

Case II. 250 to 260 horsepower.

If it should be considered, by the man at the front, practicable to use the same airplane for Army observation work and for all fighting the machine which would be the result of a compromise would be somewhat as follows: The wing loading, with full load carried, should not be more than 35 kilograms per square meter. The military load will be about 235 kilograms. Assuming a water cooled engine with a successful device installed for maintaining power practically constant up to altitudes of 6,000 meters the ideal power would be about 260.

The third division under functions is to "inflict direct damage upon the enemy." By this is meant bombing operations. These comprise practically all the real damage that it is, at the present time, possible for an airplane to inflict upon the enemy. In comparison to these the slight damage caused by bringing down his airplanes, each containing one or two men only, or shooting up his trenches or truck trains, is negligible.

Under bombing operations, two essential divisions are bombing by day, and bombing by night. Under conditions as they exist in the air at the present along the western front the material damage must be done by night bombers, day bombers being used largely for moral effect, "to give the enemy no rest," except for few special cases where enemy strong points are difficult to locate at night, or when the enemy strong point must be destroyed quickly during the new moon season.

I will discuss the day bomber first.

The primary military functions of the day bomber are:

To bomb important points, such as small objects difficult to find by night, such as headquarters, small ammunition "dumps," small storehouses containing munitions or supplies, small railway junctions, small aerodomes. Also to bomb such communities as it is considered desirable, on account of the moral effect, with the idea of giving the enemy no rest, by day or night. The usual practice will be for a number, say, 25, to fly in regular and rather close formation during day bombing raids.

This airplane will also probably be used to conduct long range reconnaissance strategical reconnaissance, reconnaissance by staff officer, or with camera.

This machine may be used for special photographic work so far beyond the lines as to necessitate great altitude, demanding a camera of great focal strength and therefore great size and weight.

The number of this type, assuming that the enemy has been driven completely out of the air by fighting airplanes, should depend upon—

The amount of such work that it is considered desirable to perform.

The number of pilots trained and available for this work.

The primary requirements for this airplane in order that it may effectively perform its military functions are:

It must be able to protect itself effectively against all hostile aircraft, which demands good speed at altitude, strong climbing ability, powerful and reliable armament, and a satisfactory degree of "handiness."

Reliable power plant.

Power plant with good fuel efficiency.

Capacity for as many bombs as will not prohibit satisfactory provisions for protecting itself against enemy aircraft as discussed above. I believe that, at the present time, it is not an economical proposition to send a trained pilot and a trained "bombardier" a great distance beyond the enemy's line unless at least 275 kilograms of bombs are carried.

Effective provision for accurate sighting for, and dropping, bombs.

Ceiling should be high enough so that the machine stands a good chance of escaping detection as it crosses the line.

A muffler for the exhaust, capable of being cut on and off at the will of the pilot, is desirable.

Two men are carried.

Two or three machine guns, one firing through the propeller disk, and one or two with all around fire, with good field to the rear. A reliable compass is necessary.

The ceiling with full bomb load and full fuel load, should be not less than 7,000 meters. The possible horizontal speed at an altitude of 5,000 meters should be not less than 200 kilometers per hour. Starting with full load the airplane should be capable of climbing to an altitude of 5,000 meters in not more than 20 minutes. The factor of safety of the main plane structure, for full load, will not be less than six for the high incidence conditions and four for the low incidence condition.

IDEAL POWER.

Assuming: Wing loading (with full load) 37.5 kilograms per square meter (7.68 pounds per square foot); military load (including 275 kilograms of bombs), 500 kilograms; weight of fuel and oil, 1.31 kilograms per horsepower (2.88 pounds per horsepower) which will permit a flight of about 470 kilometers (292 miles) beyond the lines and return; weight of power plant (including radiator and water):

Case I (no device for maintaining constant power at all altitudes). 2.44 kilograms per horsepower at 5,000 meters altitude), 1.3 kilograms per horse power at sea level.

Case II (turbine for air intake, or other device for maintaining power constant at altitudes). 1.4 kilograms per horsepower (3.09 pounds per horsepower).

The ideal power would be:

Case I. 495 horsepower at 5,000 meters (930 horsepower at sea level).

Case II. 520 horsepower.

An engine developing 363 horsepower at 5,000 meters and weighing (complete with radiator and water and constant power device) 510 kilograms (1,120 pounds) would be the ideal engine under the conditions assumed above for a day bomber, with any of the following characteristics:

Distance of objective beyond the lines.	Weight of bombs.
388 kilometers (241 miles).....	136 kilograms (300 pounds).
340 kilometers (211 miles).....	182 kilograms (400 pounds).
292 kilometers (181 miles).....	227 kilograms (500 pounds).

For every 30 miles farther increase in radius to reach the objective, 100 pounds of bombs are sacrificed.

Typical airplanes of the day bomber type are the De Haviland-9 (British), with 300-horsepower Fiat engine, the S. I. A.-7B (Italian) with 200-horsepower Fiat engine, the S. I. A.-9B (Italian), with 600-horsepower Fiat engine, and the Brequet (French) 14-B2, with the 300 horsepower Renault engine.

The German Gotha twin motor machine (2-260 horsepower Mercedes engines while rather too slow and too unhandy for the purpose, has done some service bombing by day over London.

The fourth and last general class is the type designed for bombing by night. This is the type which in my opinion must be depended upon to inflict real material damage upon the enemy. I believe that the consistent employment of these machines in large numbers on every good night in bombing Germany's munitions factories, factory towns, important railway junctions, large munition depots, the bridges across the Rhine, the Kiel Canal, important docks, submarine bases, and certain cities, would, in a shorter period of time than is possible by any other means, end the war.

Let us suppose that, only for half the time, it will be possible to find a considerable period during some part of the night in which there is clear bright moonlight. Suppose that every time such conditions occur, fleets of several hundreds of night bombing airplanes, each airplane carrying a ton and a half of bombs, start out from large aerodromes located, say, 25 miles in the rear of the lines, and penetrate to Esson, for instance, or Zeebrugge. Each machine locates its objective and drops, say, ten 160-pound bombs of the high explosive type on the factories themselves, and forty 25-pound bombs filled with poisonous gas, and twenty-four 25-pound bombs of the incendiary type throughout the factory town, and returns to its objective.

In the existing phase of the present war, were our night bombing airplanes of sufficient numerical strength, it would be no longer a matter of individual and isolated raids on selected places at which the maximum of injury could be inflicted, but rather a continuous and unrelenting attack on each and every point of strategical importance. Depots of every kind in the rear of the enemy's lines would cease to exist; rolling stock and mechanical transport would be destroyed; no bridge would be allowed to stand for 24 hours; railway junctions would be subject to continuous bombardment, and the lines of railway and the roads themselves broken up nightly by giant bombs to such an extent as to baffle all attempts to maintain or restore communication.

In this manner a virtually impossible zone would be located in the rear of the enemy's defenses, a zone varying from 100 to 200 miles in width. As soon as this condition has been brought about, the position of the defending force must be considered as precarious and, eventually impossible, not only will the defense be strangled from the uncertainty and lack of supplies of all kinds, but ultimately retreat will become impossible. The defending force will find itself literally in a state of siege under the worst possible conditions, for the position will be one in the form of an extended line along which the forces of all arms will be definitely immobile, for the lateral communications will suffer no less than the lines from the rear. In short, a vertiable reign of terror would exist. Such a condition presents all the elements conducive to complete and irreparable disaster.

I can not help believing that such methods would put an end to the war far more quickly than sending one or two million men to line the trenches, with no possible hope of gaining at the very best more than a couple of miles a month.

In this connection it must be remembered that the German forces, when driven slowly back, have, during the process, tremendous advantages because of being on the defensive. Troops advancing upright over open ground, exerting themselves so that their aim will be inaccurate, suffer in loss of men infinitely more than the troops protected in the trenches, under good control, with good rests for aiming their rifles. Barb-wire entanglements, and other obstacles, give the defenders a very great advantage over the advancing troops. These are laid so as to subject the advancing troops to heavy enfilading fire from machine guns and rifles in the trenches. The retreating troops can retire at will through well covered communication trenches. In every case where they retire slightly at some point they will have previously at their leisure chosen carefully, and fortified strongly, advantageous new lines for their trenches. They will have prepared carefully the terrain in front of their new lines so as to leave it clear for deadly fire against our troops advancing. They will have measured and recorded the ranges to certain permanent landmarks in this region so as to make their fire against our troops, advancing over unknown ground, more effective. They will have measured carefully the range from their artillery batteries to the trenches from which they retire, and which will be occupied by our men, in order that they may slaughter our men by shell fire before they can "dig in."

On clear moonlight nights it is not difficult, if the map be studied carefully, and good judgment used, for the pilot of an airplane to find his way and locate the objective. Important factories and depots must necessarily be alongside railroads, and by following railroads it should always be possible to arrive at any given objective. If the pilot should lose the railroads he can always bear west until he comes to the shore line, which, on a good night, is always readily discernible because of the surf, and follow this to the northeast until he comes to some mark which he recognizes and

which will relocate him on his map and give him a fresh start. Zeebrugge and other towns on the coast are easily found. Essen may be found by following the Rhine.

It is impossible to defend effectively against airplane bombing by night, especially if there be bright moonlight. Suppose an altitude of 9,000 or 10,000 feet be obtained before crossing the line, and maintained until nearing the objective. Mufflers for the engine exhaust should help escape detection or, at any rate, definite location from the ground. Upon nearing the objective the airplane descends to, say, 6,000 feet altitude, and maintains this altitude until after the bombs have been dropped. If there be good moonlight, and the pilot keeps the moon at a certain location with respect to his position and that of the objective, it is absolutely impossible to see the airplane from the ground.

Even if a powerful battery of searchlights, manned by very expert crews, be employed, it is next to impossible to pick up the airplane at this altitude. Even should it be picked up and held in the beams of searchlights, the chances are very small that the airplane will be brought down by antiaircraft gunfire. Defensive airplanes are, at the best, next to useless at night. It may be that the bombing airplanes can get through and arrive at their objective without sufficient warning being given to permit defensive airplanes taking the air and obtaining sufficient altitude to engage before the bombing airplanes have dropped their bombs. Assuming, however, that sufficient warning has been given, airplanes of the fast-fighter type can not be employed at night on account of the very high speed necessary on landing except by very few of the most expert pilots. Even could these be employed, the chances are very small that they will be able to find the bombing machine in the air, and, again, should they by some chance find the bombing machine, it is quite probable that the defending airplanes will not recognize the bomber as being an enemy if they, the defenders, know that the air is filled with defending machines. Small searchlights are used on defensive machines, but, while they do prevent many collisions between defending airplanes wandering aimlessly through the air, they also afford an excellent target for gunfire from the bombing machine, should the latter choose to allow a defender, from whom he can easily see, to come near him. There is no need for the bombing airplane, unless he chooses to deceive the defenders by using the same system of lights as the defending airplanes adopt, to carry any lights whatever. His purpose involves merely flying, in regular course, once across above the objective, then turning, and steering wide of all defenders, returning home by the quickest and safest route. As soon as the heavy bomb load has been released the airplane will quickly rise to an altitude of 12,000 to 14,000 feet, where it will be comparatively safe.

If a great number of airplanes be sent over one given objective, it is best to assign one route for the airplanes traveling at, say, seven or eight minute intervals, to pursue while going out, and another route while returning. Pilots should also be instructed to fly at different altitudes, for instance, A machine at 7,000 feet, B machine at 8,000 feet, C machine at 9,000 feet, D machine at 7,500 feet, E machine at 8,500 feet, F machine at 9,500 feet, G machine at 7,000 feet, etc. By these methods collisions between bombing airplanes would be avoided.

In cases where it is of particular importance to pick out one building from a group that is of special value to the enemy, or when the light conditions during the night are not very good, it is entirely practical to send out the bombers, leaving the aerodrome at such time that they will arrive at the objective exactly at the "crack of dawn." In this way they will be able to drop their bombs before the enemy pursuit airplanes will have been able to take the air and gain sufficient altitude to engage. It is probable that the day bomber would be used for this work on account of its great speed in returning home.

The number of night-bombing airplanes built and supplied should depend solely upon the number of pilots available for this work.

A far lower degree of expertness is required to pilot a large slow night bomber than for a fast fighting machine.

As a matter of fact, the number built and supplied will, in all probability, depend upon steamship space for trans-Atlantic transportation, hangar space at the aerodromes in France, and, even, possibly, upon the appropriation available.

The primary requirements for these machines in order that they may effectively perform their functions are:

Great bomb capacity.

Reliable power plant.

Power plant with good fuel efficiency.

Proper degree of stability and controllability to permit a pilot of ordinary ability and a very limited amount of training, flying and landing at night.

Effective provision for accurate sighting for, and dropping, bombs.

Accurate compass and other instruments necessary for navigation by night, with provision for reading conveniently at night.

Two to five men may be carried. Probably the best practice is a crew of three, a chief pilot, a "bombardier," and one man to man a gun forward or to the rear, as may be necessary, and to act as relief pilot.

The load of bombs which may be carried will depend upon the total power available at an altitude of 3,000 meters, and upon the distance of the objective (which will regulate the initial fuel supply). The ratio of total weight of airplane, with full initial load, to the total power available, should be small enough to permit a ceiling of at least 3,500 meters, starting with full load. The power plant will be divided into two, or possibly three, units. Suppose that two United States Army 12-cylinder engines be installed, if no device is incorporated to maintain the power constant with change in altitude, the total power available at 3,000 meters altitude should be about 450 horsepower. Suppose that the objective lies 250 kilometers beyond the lines, a bomb load of between 900 and 1,200 kilograms may be carried, and the necessary initial ceiling obtained, provided the general design of the airplane be good.

The total weight of the airplane in kilograms with full initial load should not be more than 10 times the number of horsepower available at 3,000 meters. The total weight of airplane, with full initial load, should not be more than 27.5 kilograms per square meter. The machine should have possible horizontal speed, at an altitude of 3,000 meters, of not less than 137 kilometers (85 miles) per hour. Starting with full load the airplane should be capable of climbing to an altitude of 3,000 meters in not more than 27 minutes.

For every 26 kilometers (16 miles) increase in radius necessary to reach the objective, 45 kilograms (100 pounds) of bombs is sacrificed.

Typical airplanes of the night-bomber type are the Caproni triplane (Italian), with three 273-horsepower Isotta-Fraschini engines, the Handley-Page (British), with two 320-horsepower Sunbeam engines; and the Caproni biplane, with three 210-horsepower S. P. A. engines. The German Gotha, with two 260-horsepower Mercedes engines, is typical.

SPECIAL TYPES.

One of the special types which may be demanded by the men at the front will be a type designed to rake the trenches, troops marching in column, truck trains, etc., with machine-gun fire. Such an air plane would be armed with three or four machine guns pointed downward at an angle of about 25 or 30 degrees to the propeller axis, probably firing under the propeller disk. Two men would be carried, both protected from rifle fire from underneath by armor. The gasoline tanks, radiator, engine, etc., would also probably be armored against rifle fire.

Another type, which I believe is an inevitable development owing to the future tactics in fighting with machines in regular and close formation, is a type which will man one or more large cannon, effective at a range up to 1,000 yards. This machine will probably be called a battle plane. Shrapnel containing very heavy buckshot will be used, the muzzle velocity being well over 1,000 feet per second. The problem of controlling the recoil of the gun without racking the fuselage structure of the air plane will be a most difficult one. This has not yet been satisfactorily solved. The Davis gun, in which there is very little recoil owing to the charges being fired in opposite directions, is very unpopular among men who have tried to use it, and will probably never be satisfactory because of the necessarily very limited range in elevation. Squadrons of battle planes flying in formation may reduce the tactics for fighting in the air to a very similar scheme as that used in naval fleet tactics.

The greatest influence on the development of types of air planes in Europe during the war has been the endeavor to counteract the development of the enemy. I believe that the records will show a great number of cases in which the development of a very excellent and advanced design has been summarily stopped because the designer was suddenly called upon to get out a machine the sole purpose of which was to meet a new type just produced by the enemy. Although necessity is the mother of invention, the exigencies of this war have driven the designers of aircraft and engines in Europe to produce equipment far in advance of anything which has been produced in the United States. I believe that it is quite probable that, had the engineers and research men in England, France, and Italy, been given more time, their investigations might have been much more thorough, and productive of better final results. Such a thing as real thorough experimentation has been impossible in England and France during the war.

In order to minimize the number of spare parts supplied to the repair stations in the field and the air-plane depots in France, it will be necessary to reduce the number of types of air planes built and supplied to the five types described above. It is entirely possible that the number may be further reduced, in the very near future, to four, i. e., 1, Army observation; 2, fighter; 3, day bomber; and 4, night bomber. The pilot actually doing the work in the field would like to have many special types

available, each designed for one particular function: Good to defend, to attack by speed, to attack by climbing and maneuvering, to attack at long range with a cannon, to reconnoiter, to photograph, to control artillery, to bomb during the day, to bomb at night, etc. Then again certain pilots will prefer, or the pursuit type, the Martinsyde, others the Spad, and others the S. V. A., etc.

I believe that probably the most important influence on the conduct of war is the group of men held responsible for deciding upon the types which will be built and supplied to the forces in the field. Such a group should comprise members who are acquainted thoroughly, through real experience, with the practical difficulties in actual service at the front, members experienced in field repair of air planes, members acquainted with the theory and practice in the design of air planes, members acquainted with the theory and practice in the design of engines, and members thoroughly experienced in the manufacture of air planes and engines and factory methods employed. They must, above all, be men of good common sense and the leader of the group should be the broadest gauge, soundest, and most progressive man available.

V. E. CLARK,
Lieutenant Colonel, Signal Corps.

STATEMENT OF MR. GLENN M. TAIT.

Senator NEW. Where have you recently been employed and in what capacity?

Mr. TAIT. At the Thomas-Morse Aircraft Corporation at Ithaca, N. Y.

Senator NEW. In what capacity?

Mr. TAIT. I was in charge of the final assembly, final wing and fuselage assembly, and also in charge of the shipping department.

Senator NEW. You spoke of the final assembly. What is made at the Thomas-Morse works?

Mr. TAIT. It is an advanced training machine, a speed scout, a single seater.

Senator NEW. And you have been in the employ of the Government; you have been there as an United States inspector?

Mr. TAIT. Yes, sir.

Senator NEW. As such inspector have you had occasion to report any defective parts of that machine?

Mr. TAIT. Who do you refer to?

Senator NEW. Have you had any occasion to report to your superiors any defective parts in the machine being made there?

Mr. TAIT. Yes, sir.

Senator NEW. Can you give us any particular instances of that?

Mr. TAIT. Do you mean Signal Corps numbers on the machines or special machines.

The CHAIRMAN. Anything.

Mr. TAIT. Up to a short time ago I had charge of about eight men and there were lots of instances of parts going through that were not right, but I could not tell the number of machines.

The CHAIRMAN. You can tell us what the parts were and the reports you made concerning them.

Mr. TAIT. The reports were made to my senior inspector and were verbal.

The CHAIRMAN. What was his name?

Mr. TAIT. Otto H. Hamm, stationed at Ithaca, N. Y. Being a training scout it is very light, and the motor is supported by ash struts in the front of the fuselage. Several times those struts have been bored wrong and they have been allowed to plug them and reset the motor and also the longerons of the machine have been bored wrong, and were allowed to be passed.

The CHAIRMAN. When you say they have been allowed to pass, do you mean that they have been allowed to be passed by the——

Mr. TAIT. By the Government inspectors. The company inspectors at the Thomas-Morse plant are simply there to fulfill the Government contract. They have not in the last two months; it is in the contract, I believe, that the Thomas-Morse Co. are to supply factory inspections and there have been several instances lately where they have passed things to me and I have made an accurate note of them that they said were all right that were wrong, and they knew they were wrong when they put them up to us.

The CHAIRMAN. Have you those notes with you?

Mr. TAIT. I have not. I did not come to Washington with this idea in view, and then a friend of mine told me that he considered it to be my duty to come and see Senator New, and for that reason I am here.

The CHAIRMAN. Are you still employed as an inspector?

Mr. TAIT. No, sir.

The CHAIRMAN. When were you dismissed or discharged?

Mr. TAIT. I put in my resignation on the ninth.

The CHAIRMAN. You resigned?

Mr. TAIT. Yes, sir; but it was requested.

The CHAIRMAN. By whom?

Mr. TAIT. By Capt. Weller, of Buffalo.

The CHAIRMAN. Is he a Government inspector?

Mr. TAIT. He is the officer in charge of the Buffalo district of inspection.

The CHAIRMAN. What reason did he assign to you?

Mr. TAIT. He did not give me any reason. I understood it was because I was holding up production.

The CHAIRMAN. From whom did you understand that?

Mr. TAIT. It is a rumor.

The CHAIRMAN. Was your resignation requested without any previous notice or advisal of the fact?

Mr. TAIT. What led up to it was for the last two months they have been gradually trying to rush production at the expense of quality, and I have been a flyer and have had two or three years' experience, and then also I was in the aviation game before the war started. I was working in the assembly at the Curtiss plant and was a foreman in the Thomas-Morse plant, and I felt probably more plainly the need of strength in certain parts than the average inspector would feel, and when these things began to rush through I began to feel bad about it. I really did not have full authority on assembly. I did all I could do to stop them.

Senator NEW. You say you were a flyer. Where did you learn to fly?

Mr. TAIT. At the Curtiss school at Hammondsport.

Senator NEW. Have you a pilot's license?

Mr. TAIT. Yes, sir.

Senator NEW. How long have you had that license?

Mr. TAIT. Ever since 1912.

Senator NEW. Have you continued your flying from the time that you got your license up to the present?

Mr. TAIT. No, sir; I was in the exhibition game, and that was the only thing which was supporting aviation at that time, and as soon

as it became a common thing I dropped back into the automobile business.

Senator NEW. Where is your home?

Mr. TAIT. At Middletown, Ind. That is my address.

Senator NEW. How did you happen to get into the Government employ as an inspector?

Mr. TAIT. I went to the plant at Ithaca with the intention of learning the depth control. I was a Curtiss pilot, and I wanted the new type of control, and at that time Mr. Thomas told me that he thought the chances were better in the manufacturing end of it, and I did not take it up, and I accepted a foreman's position in the Thomas factory, and that was, I think, in April, 1917, and I continued in the Thomas Co.'s employ until the last of November of last year, and then I put in my application for the aviation school, or was intending to, but was thrown out on physical examination, and I think it offended the Thomas Co. because I did so, so I left the Thomas Co. and went into the Government employ, and that is how I happened to be in the Government service.

Senator REED. You say that inspection is sacrificed to production?

Mr. TAIT. Yes, sir.

Senator REED. At the Thomas-Morse plant. Just what do you mean by that?

Mr. TAIT. I mean that concessions are given beyond the specifications to allow production, and sometimes those concessions are given by men that have not had experience in aeronautics and I consider they are a dangerous thing when they are given in that way, and I think that they ought to be given by a man that understands thoroughly what strength is required and what it means to have a certain part break. I understand that foreign inspection, English and French inspection, is given the predominant power instead of production, and on this side I understand that production has the power over inspection. I have talked with Army officers and they tell me that.

Senator NEW. In other words, your general complaint is that quality here is sacrificed to quantity?

Mr. TAIT. Yes, sir.

Senator NEW. To an extent that you think is dangerous. Is that right?

Mr. TAIT. Yes, sir; I think it is in some cases.

The CHAIRMAN. What defects, other than those you have previously mentioned, have you discovered there in the material?

Mr. TAIT. I think it is a general reluctance on the part of the inspection, and the inspection is not any too good to start with because the average inspector has not had airplane experience.

The CHAIRMAN. When you were there you did your duty and you discovered some defects. You have mentioned some of them. Are there any others that you yourself discovered?

Mr. TAIT. Yes, sir; such as cracked terminating struts, loose fuselage clips, things that have been rewelded after being made wrong, and at this time on the machine being built there the wing ties are of such a design that they can not be welded and stand heat treatment, and they are going through an operation called dip brazing. In this dip brazing they dip the whole entire fitting into the brazing compound, and I have found several of those fittings when sawed through, and I would see cracks underneath the brazing; that is something that can not be found out by outside inspection.

The CHAIRMAN. Is this brazing a veneer or covering of some sort?

Mr. TAIT. It is steel parts brazed together with brass spelter.

The CHAIRMAN. Were these defects of which you have just spoken typical or the exception occurring here and there in a particular machine?

Mr. TAIT. Probably here and there.

The CHAIRMAN. You would report these things verbally to your superior?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Do you know what he did with them?

Mr. TAIT. Some were passed.

The CHAIRMAN. You mean that notwithstanding your complaint they were permitted to go into production?

Mr. TAIT. Yes, sir.

The CHAIRMAN. In every instance?

Mr. TAIT. Not in every instance.

The CHAIRMAN. Some of the parts were rejected and others were not?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Did Mr. Hamm ever consult you or speak with you about these inspection reports?

Mr. TAIT. Yes, sir.

The CHAIRMAN. What comments did he make upon them?

Mr. TAIT. He said that he could not hold them too close or he would not have production.

The CHAIRMAN. Did he say that more than once?

Mr. TAIT. Yes, sir; several times.

The CHAIRMAN. What was his business prior to his appointment?

Mr. TAIT. He was a graduate of Cornell, an M. E. of last year.

The CHAIRMAN. A mining engineer?

Mr. TAIT. A mechanical engineer.

The CHAIRMAN. A graduate of last year?

Mr. TAIT. Yes, sir.

The CHAIRMAN. A man, then, of little practical experience?

Mr. TAIT. I think he is about 22 years old.

The CHAIRMAN. Did he go from Cornell practically into this factory?

Mr. TAIT. Directly; yes, sir.

The CHAIRMAN. He is a resident of Ithaca?

Mr. TAIT. No, sir; I think he is a resident of Baltimore.

The CHAIRMAN. When was your resignation requested?

Mr. TAIT. July 3; but the request was not made known to me until the 9th.

The CHAIRMAN. Who made it known to you?

Mr. TAIT. Mr. Hamm.

The CHAIRMAN. Did you ask Mr. Hamm what it was based upon?

Mr. TAIT. I think he knew. What he thought and what I thought was that it was on the complaint of the Government production man at Ithaca.

The CHAIRMAN. Who is the Government production man there?

Mr. TAIT. Mr. Robbins.

The CHAIRMAN. What was his business before he entered the Government employ?

Mr. TAIT. I do not know, When he came he did not know any thing about airplane construction.

The CHAIRMAN. When did he come there, about?

Mr. TAIT. About six or eight weeks.

The CHAIRMAN. Before or after you came?

Mr. TAIT. Afterwards.

The CHAIRMAN. How old a man is he?

Mr. TAIT. I imagine about 28 or 29 years old.

The CHAIRMAN. A young man?

Mr. TAIT. Yes, sir.

The CHAIRMAN. What is their present weekly production of machines, about?

Mr. TAIT. They have no regular production. It has gone as high as 18 and as low as 2.

The CHAIRMAN. With what engine is the plane equipped?

Mr. TAIT. Up until a short time ago we used a 100-horsepower Gnome; a rotary engine.

The CHAIRMAN. What have you been using since?

Mr. TAIT. An 80-horsepower Le Rhone.

The CHAIRMAN. You used a rotary type of engine in each instance?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Do you know where those planes were shipped to?

Mr. TAIT. All over the country. I think a large amount of them went to Lake Charles. I think they are the only training scout at Lake Charles, or they were the last time I knew about it.

The CHAIRMAN. Would you have given this information, Mr. Tait, had you not been relieved of your position?

Mr. TAIT. No, sir. I am glad you asked it, because it gives me an opportunity. I could not reach anyone, or thought I could not under the rules of the Signal Corps, and so in May, in the middle of May, I joined the A. P. L.

The CHAIRMAN. What is the A. P. L.?

Mr. TAIT. The American Protective League, and through it I hoped to get this news to somebody higher up. Instead of that the reports went into the Department of Justice, and the Department of Justice evidently referred it back to the Buffalo office of the Signal Corps, and they sent two men down, supposedly secret service men, or military intelligence men, and those two men, or somebody that they informed, told of all my information, and they told it, and so they put me in a very embarrassing position. My only reason for joining the A. P. L. was to get an outside——

The CHAIRMAN. A medium of communication?

Mr. TAIT. A medium of communication, as everything that goes from an inspector to the district office passes through the senior inspector, and everything that goes from the district office passes through the district office manager's hands, and if either of those gentlemen see fit to kill anything they can stop it. That is, the underinspectors have no right to appeal to any one——

The CHAIRMAN. You can not go over the head of anybody?

Mr. TAIT. Yes, sir. I think that while Mr. Hamm, I suppose, resented it a little bit, still he was very nice about it, and was very sorry to see me go. In fact, when the request for resignation came on July 3, he held it six days because he knew that I would resign as soon as I got it, and then he wrote a letter to me without my requesting it.

stating that my services had been O. K. and everything was all right. The way that this request for transfer came about was that I saw no way to bring it to the district office except by a request for a transfer.

The CHAIRMAN. Why did you want to be transferred?

Mr. TAIT. I did not care to be transferred, but when you do that you get a chance to give a reason for your request.

The CHAIRMAN. Your purpose, then, was to use that as another method of giving information to those higher up regarding the unsatisfactory conditions of inspection?

Mr. TAIT. Yes, sir.

The CHAIRMAN. I will read this letter, addressed to Capt. Clark, district manager:

A request for transfer. The writer hereby makes request to be transferred. Would prefer location in the Middle West if possible. The reason for this request is that surroundings make it impossible for writer to discharge what he considers to be his duty. For further information the writer refers you to Capt. Whitman.

Mr. TAIT. That letter was not sent to the Buffalo office. It was kept at Ithaca.

The CHAIRMAN. Was it your fault that it was not sent?

Mr. TAIT. No, sir; I delivered it to the senior inspector. Seeing it on the files, I wrote this letter with a postscript.

The CHAIRMAN. The second letter you hand me is a copy of the first with a postscript reading that "this is a copy of the original handed to Mr. Hamm last Monday, to go through regular channels. It has not been sent to you." Did you send that to Capt. Clark?

Mr. TAIT. I sent that directly.

The CHAIRMAN. About how soon was that before you were requested to resign?

Mr. TAIT. Two or three days, I think. This is the letter requesting the resignation.

The CHAIRMAN. The letter requesting the resignation, directed to Mr. Hamm, is entitled, "Transfer of Mr. Glenn M. Tait," and reads as follows:

This office is in receipt of a copy of letter from the above-mentioned gentleman requesting transfer. It is regretted that this office has no authority to transfer a man from one district to another.

2. It is requested that you immediately request the resignation of Mr. Tait. It is believed that he will have no difficulty in finding a position elsewhere.

By direction of the district manager.

JOSEPH F. WELLER.

The CHAIRMAN. You requested a transfer and got a discharge?

Mr. TAIT. I knew that they could not give me a transfer out of the district, which is the reason I requested a transfer.

The CHAIRMAN. As soon as you were informed of the contents of the letter last read you presented your resignation?

Mr. TAIT. Yes.

The CHAIRMAN. To take effect immediately—on July 10th?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Where have you been since?

Mr. TAIT. I spent two days in Ithaca, N. Y.

The CHAIRMAN. You now show me a letter from Mr. Hamm to yourself which you say was given you without consultation:

to whom it may concern:

Be it known that Mr. Glenn M. Tait has been employed by the Signal Corps of the United States Army for a period of seven months with the duties of inspector of air-

planes at this station, under the supervision of the writer, and has proved to be a conscientious, capable, and direct-spoken man and an exceptionally good mechanic. Mr. Tait has left the employ of the Signal Corps of his own free will, and it is likely that he is seeking other connections.

O. H. HAMM, *Inspector.*

The CHAIRMAN. We are very much obliged to you, Mr. Tait, for your information.

(Whereupon, at 5 o'clock p. m. the subcommittee adjourned until 10.30 a. m., July 17, 1918.)

AIRCRAFT PRODUCTION.

WEDNESDAY, JULY 17, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 10.30 o'clock a. m. pursuant to adjournment, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Frelinghuysen, Reed, and New.

Also present: Mr. John A. Jordan, Mr. A. A. D. Lang, and Mr. W. F. Ardis.

STATEMENT OF MR. JOHN A. JORDAN—Resumed.

The CHAIRMAN. Tell the committee what interferences were met with in the procuring of raw materials, and what the quality of the raw materials procured was?

Mr. JORDAN. In order to answer that question fully and intelligently—if I had that correspondence here which you have subpoenaed from Sacramento, Cal., it would tell the whole story.

The CHAIRMAN. It is on the way.

Mr. JORDAN. That will not only jog my memory but also check my statements.

The CHAIRMAN. What promises, if any, did you have from the Curtiss people for plans or materials made prior to your refusal to sign the cross-licensing agreement, and how were those promises afterwards performed?

Mr. JORDAN. I saw Mr. Glenn Curtiss in Buffalo before I refused to sign the cross-licensing agreement, and I asked him if he would help us out to the extent of giving us a fair start with the small metal parts which there was some difficulty in obtaining at that time; if he could give us a start on 20 or 25 machines so that we might go ahead with the order, and that would give us a breathing spell in which to bring in the parts from other manufacturers in case he could not continue to supply them. He said, "We will do that all right, and we want to cooperate with you in every way we can." There was some more conversation, but that is the meat of it. So I came back to Washington and got my contract with orders to go to Buffalo and get the blue prints and the specifications, and in Buffalo Mr. Guy and Mr. Morgan took me in their private office and said, "Mr. Jordan, you understand this association matter?" I said, "No; I do not know much about it." and Mr. Guy seemed to do most of the talking, although Mr. Morgan would chip in once in a while, and Mr. Guy said, "As a preliminary to our giving you any plans and specifications, we will expect you to pay a royalty of \$240"—or whatever the figure was—and he went on to explain to me how that was divided between the Curtiss concern and the Wright-Martin concern; that each one would get a part of it, and I said, "You fel-

lows seem to be getting the worst of it." They were getting about \$40 and the Wright people about \$200, and he said that the Wright patents expire so much earlier than ours that they will be shut off earlier than we will be. They said, "Anyhow, you have to pay this before we will give you the plans and specifications." I said, "How much of a holdup is this?" And he said, "You bring in here 10 per cent of 1 per cent of your contract and we will let you have the plans and specifications if you will agree to give us the balance when you get back to Sacramento," and I told him, "I do not propose to do any such thing. There is nothing in my contract that calls for the payment of substantially \$75,000 to you under any circumstances."

Senator REED. Was that what the royalty or charge would have amounted to on your contract?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. What position did Mr. Glenn Curtiss hold in the company?

Mr. JORDAN. Just about that time there came some shift in the company and Mr. Curtiss seemed to lose his authority. He eventually left the company.

The CHAIRMAN. When you had your talk with Mr. Curtiss was he in authority there?

Mr. JORDAN. Yes, sir; I think he was president at that time.

Senator NEW. I understand that this talk which you have just described was between Mr. Morgan and Mr. Guy.

Mr. JORDAN. Yes. Mr. Curtiss in the meantime had been eliminated.

Senator NEW. You have not yet answered Senator Thomas' question, which was to tell about the interferences that you encountered, except that you have told us they declined to give you the blue prints until you signed the agreement. What happened, if anything, to you with reference to their refusal to give you the parts which they said they would give you?

Mr. JORDAN. I took it up with Mr. Morgan and he said, "We will help you out on that." He said, "We will give you the angles and bending of the plates which can not be shown on a blue print, and I will do that anyhow, and I will send them down to the hotel to you."

Senator REED. Was that before or after you had had the talk about the license?

Mr. JORDAN. That was before. There was very little talk after I got back to Buffalo and got the blue prints.

The CHAIRMAN. Did he ever furnish you with those parts?

Mr. JORDAN. He never furnished me with anything. He afterwards sent out to Sacramento some alleged samples of the parts, but they were useless and did not fit. They were not the correct material and were not in the right shape.

Senator REED. You came to Washington and you arrived at an understanding with the authorities that you would be given contracts, but before your contracts had actually been signed or delivered to you, you were told by the Washington authorities with whom you were dealing that you would get your blue prints, etc., from the Curtiss Airplane Co.?

Mr. JORDAN. No, sir; I understood that the Aircraft Board would give me all necessary blue prints, specifications, and data to carry out my contract. That is the invariable practice in all Government contracts.

Senator REED. The next step was that you saw Mr. Glenn Curtiss at Buffalo, and you told Mr. Curtiss that you would want the blue prints, and that you would also want certain small metal parts furnished to you until at least you could arrange for the manufacture of them for yourself, and that, in any event, you would want enough of those parts to constitute samples, so that you could get the exact curvatures, which could not be well shown in the blue prints, and Mr. Curtiss assured you that you could have those parts. Did he tell you at that time that you could have enough parts to make some few of these machines to begin with or simply say he would furnish you samples?

Mr. JORDAN. No. He said, "We will help you out." I know Mr. Curtiss personally. My talk with Curtiss was several weeks before I got the contract.

Senator REED. After you had talked to Mr. Curtiss was it on the same visit that you saw Mr. Morgan and Mr. Guy?

Mr. JORDAN. No; I saw Mr. Curtiss but once.

Senator REED. Was it after you saw Mr. Curtiss that you saw Mr. Guy and Mr. Morgan?

Mr. JORDAN. Yes, sir.

Senator REED. How long afterwards? On the same trip?

Mr. JORDAN. No, no; on another trip.

Senator REED. Some days had elapsed.

Mr. JORDAN. Five or six weeks.

Senator REED. And in the meantime you had come back to Washington and closed your contract?

Mr. JORDAN. Yes, sir.

Senator REED. And after you had closed your contract you went back to the Curtiss aeroplane factory to get your blue prints, and you secured these parts. Is that right?

Mr. JORDAN. Yes, sir.

Senator REED. And you saw Mr. Morgan and Mr. Guy?

Mr. JORDAN. First, Mr. Morgan.

Senator REED. First, Mr. Morgan. And you told him that you had come after the blue prints, and that you would want these metal parts. Is that correct?

Mr. JORDAN. That is correct.

Senator REED. Did you tell him that you wanted parts for a number of machines or simply samples?

Mr. JORDAN. I asked him for all the parts that he could possibly furnish. He had the dies and machinery to turn out a greater number of parts than he could possibly use. That covered certain parts which were very necessary, and he said: "Yes; we can bang those out for you," and I said, "All right; we will take all you can ship me up to about 300 machines parts if it is necessary," and he said, "I will not promise to give you any definite amount but will give you whatever I can out of my surplus."

He sent me through the shops with one of his junior engineers to see the working of the shops.

Senator REED. Did you go through the shops with the engineer?

Mr. JORDAN. I did; and he showed me all of the machinery, and I was very much interested.

Senator REED. Do you know that engineer's name?

Mr. JORDAN. No; but I could locate him there.

The CHAIRMAN. Was that before you refused to sign the agreement?

Mr. JORDAN. Yes; the young fellow showed me all the methods of their spot welding and heat treating, etc. I spent two days there. and everything was very friendly.

Senator REED. Did you talk at the same time about the blue prints?

Mr. JORDAN. Yes.

Senator REED. What was said about the blue prints?

Mr. JORDAN. They showed me the——

Senator REED. What was said about whether or not they would give you those blue prints? I am trying to get at the chronology of this thing. You went there and told them that you would want the metal parts, and they sent a man through the factory with you. Up to that time you had not discussed the question of the cross-licensing agreement, had you?

Mr. JORDAN. No, sir.

Senator REED. Before you did discuss the question of the cross-licensing agreement, was any reference made to the blue prints?

Mr. JORDAN. No; the only reference was the fact that they were digging them out.

Senator REED. Before anything was said about the cross-licensing agreement between you and Mr. Morgan, what was said about the blue prints?

Mr. JORDAN. The cross-licensing agreement was in Mr. Guy's hands. Mr. Guy was handling that end of it, and there had been nothing said about that until Mr. Guy came upon the scene.

Senator REED. I want to know what had been said about the blue prints before anything was said by any one to you about a cross-licensing agreement.

Mr. JORDAN. I gave my letter to Mr. Morgan. You have the letter here. It was an order for the blue prints, and he turned it over to the engineering department, with an order to get the blue prints out. I was in Buffalo four or five days and visited the plant daily, and about the second day after I got the blue prints checked—nothing was said about the cross-licensing agreement until I got them checked, and then they took me in the office and Mr. Guy said, "You understand what is required here before you take those blue prints?" And I said, "Yes; I know partly about it."

Senator REED. What did he say was required?

Mr. JORDAN. He explained that I would have to pay to the Curtiss Co. 1 per cent direct for the use of the blue prints and the flat sum of \$240, as I remember it—the contract is here that he offered me—I was to pay that on each airplane which we sold, but the flat sum of 1 per cent on the entire contract would have to be paid direct before we took the blue prints and before I went to Sacramento.

Senator REED. You declined, as you have already said, to be held up, or to pay this \$75,000?

Mr. JORDAN. Yes, sir.

Senator REED. What was the next step which was taken?

Mr. JORDAN. I returned to Washington.

Senator REED. You did not get the blue prints?

Mr. JORDAN. I did not.

Senator REED. And you did not get any metal parts?

Mr. JORDAN. I got nothing, and I returned to Washington and laid the matter before Mr. Coffin, and he said, "That is too bad. I do not see any necessity for paying those fellows anything," and he said, "I will see that you get the blue prints, and you go over and

see Montgomery," and Montgomery sent his brother with me to Buffalo.

Senator REED. Mr. Montgomery held what position?

Mr. JORDAN. He was Col. Montgomery in charge of the contract department.

Senator REED. Did his brother hold any position?

Mr. JORDAN. He was the attorney of the board.

Senator REED. And the attorney of the board went with you to Buffalo and demanded the blue prints, and you got them?

Mr. JORDAN. Yes.

Senator REED. Who did he demand the blue prints from?

Mr. JORDAN. I do not know. They arranged that in the office. I was not present.

Senator REED. Do you know Mr. Montgomery's initials?

Mr. JORDAN. W. W. Montgomery.

Senator REED. Do you know whether he is still in Washington?

Mr. JORDAN. I do not.

Senator REED. When you got the blue prints, were they not complete?

Mr. JORDAN. They were not complete.

Senator REED. When did you discover that they were not complete?

Mr. JORDAN. While I sat there checking them. The first set of blue prints I checked and put them in a bundle, and when I went back the second time I could not get that set, and I had to check a new set. They were very incomplete and badly drawn, and the details would not fit the general plan.

Senator REED. Would it be possible from those blue prints to build the plane you had contracted to build?

Mr. JORDAN. Absolutely impossible.

Senator REED. What occurred in reference to these blue prints?

Mr. JORDAN. I said to Mr. Morgan, "I have not any general-assembly plan." That is, the general-assembly plan of the machine complete. From that general-assembly plan we draw off a detail of the various parts, like the clips and other parts, and when they come together they must all fit in the general-assembly plan in their respective places. That shows where each part goes. I said, "I want this general-assembly plan, and I want it right now." And he said, "I will have that in your hands as soon as you reach Sacramento," and it did not reach me until December.

Senator REED. When were you there?

Mr. JORDAN. About September 30.

Senator REED. You lost two months?

Mr. JORDAN. Two good, long months. I was also short nose-plate plans, which is a vital part of the machine.

Senator REED. You were also short of plans for them?

Mr. JORDAN. Yes; and those parts are the foundation of the engine, substantially. You could not build the machine without them. They did not reach me until some time in January.

Senator REED. The plans, you mean?

Mr. JORDAN. Yes. I wrote to everybody in the department that I knew of—Montgomery, Shepler, and Farwell and to Mr. Curtiss—urging him to send on these blue prints to me, and I could not get them until January. It took us three months to redraw the blue prints which we already had.

Senator REED. What transpired about the metal parts which had been promised to you?

Mr. JORDAN. I called Mr. Guy on the telephone.

Senator REED. From where?

Mr. JORDAN. From the Iroquois Hotel in Buffalo, and Mr. Guy said, "It is all a mistake. We can not give you any metal parts."

Senator REED. What did he say that in reply to?

Mr. JORDAN. To my question to him. I said, "You promised to send me some metal parts to the hotel and also to ship some to Sacramento," and then he said, "It is all a mistake, and you can not have any metal parts," and in this correspondence which is coming you will find letters pertaining to the same thing, and I wrote to Buffalo appealing to Mr. Morgan on my arrival at Sacramento. I reminded him of his promise to give me samples.

Senator REED. You were in Buffalo and talking to Mr. Guy over the telephone?

Mr. JORDAN. Yes.

Senator REED. And you were in the Iroquois Hotel and he was at the factory?

Mr. JORDAN. Yes.

Senator REED. When was that?

Mr. JORDAN. In the first part of October. I have not the exact date.

Senator REED. You have given that whole conversation, have you?

Mr. JORDAN. Substantially; yes.

Senator REED. Did you not appeal to him?

Mr. JORDAN. Yes; I argued with him and he said it did not make any difference. I asked him if Mr. Morgan was in authority and he said that he [Guy] was in authority.

Senator REED. Did you tell him that Mr. Curtiss had promised to make those for you?

Mr. JORDAN. I did, and he said that he would assume the responsibility for refusing me.

Senator REED. Did you tell him that Mr. Morgan had promised these metal parts?

Mr. JORDAN. I did, and he said that he would assume the responsibility for the refusal.

Senator REED. Did you finally ask him to give you mere samples?

Mr. JORDAN. I did, and he said it was not their practice to give out samples.

Senator REED. Did you or not tell him that you could not, from the blue prints, make the metal parts without great difficulty, because of the angles and curvatures, which were difficult to reproduce from the blue prints?

Mr. JORDAN. Yes; I told him that, and he said, "You will have to do as we did, and everybody else has to do, and make them fit."

Senator REED. Did you tell him of the fact that Mr. Morgan had sent you out through the factory and shown how these plates were made and fitted up with dies to make the parts?

Mr. JORDAN. Not to Mr. Guy; no.

Senator REED. In general, you did go through the situation with him and you reviewed the history of it, and he insisted upon his declination and he would not let you have these parts?

Mr. JORDAN. Yes, sir; absolutely. I said, "Does Mr. Morgan's, the president's, word go?" And he said that he himself was in authority.

Senator REED. This occurred after you had declined to sign the cross-license agreement?

Mr. JORDAN. Yes, sir.

Senator REED. How long afterwards—on the same visit?

Mr. JORDAN. On the same visit on which I got the plans, a day or two afterwards.

Senator REED. You got the plans after you had gotten the lawyer of the board and he had gone up with you and they had been practically compelled in this way to turn over the plans, and it was on this same visit to Buffalo, a day or two later, that you had this conversation, and they refused to give you the parts?

Mr. JORDAN. Yes.

Senator REED. And the first refusal you had for these parts was after you had refused to sign the contract for \$75,000?

Mr. JORDAN. Yes; all the row occurred after that refusal. Up to that time I guess I could have had the factory.

Senator REED. Do you mean by that statement that everything appeared as though they wanted to be accommodating?

Mr. JORDAN. Very.

Senator REED. And they were willing to give you practically everything that you needed?

Mr. JORDAN. Yes.

Senator REED. And to facilitate the carrying out of your contract?

Mr. JORDAN. Yes, sir.

Senator REED. But after you refused to sign the agreement they refused to deliver you anything—the blue prints, the metal parts, or anything else?

Mr. JORDAN. Yes.

Senator REED. And they finally did deliver the blue prints after you had made a trip to Washington and gone up there with an attorney of the board?

Mr. JORDAN. Yes, sir. I was just going to say that Mr. Morgan said to me in an offhand way, "Mr. Jordan, why don't you be a good dog?"

Senator REED. What did he say that in connection with?

Mr. JORDAN. After I refused to sign. That means in the contracting business——

The CHAIRMAN. Did you sever your connection with the Liberty Iron Works, in San Francisco, as a result of any differences or controversies?

Mr. JORDAN. There was no material controversy, only they thought I was not getting along fast enough as manager of the thing.

The CHAIRMAN. There was no friction there which has impelled you to sever your connection with the company?

Mr. JORDAN. Not a particle. What brought me to Washington more than anything else was not to criticize what was behind us, but what is in front of us; it is because these men are sending out bad parts.

The CHAIRMAN. At what flying field?

Mr. JORDAN. The Mather Flying Field, at Sacramento, Cal.

The CHAIRMAN. Maj. Emmons was the commander of that field?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. When did he tell you that?

Mr. JORDAN. About June 25; somewhere along in there. He said that "the inspection of planes coming in here is simply rotten."

The CHAIRMAN. Is he using them at all?

Mr. JORDAN. Yes; but he has been repairing them in his own field, and one vital part of the machine is the little bell pull that controls the afterrigging and the elevator and the afterpart, and he is reinforcing that by putting a piece of tubing inside of it. They were also soldering up and putting plates on the side of the rocker arm.

Senator REED. Who was doing that?

Mr. JORDAN. Maj. Emmons's man.

Senator REED. That did not apply to the Liberty Iron Works only, but the other three works out there as well?

Mr. JORDAN. The Fowler Co. and the United States Aircraft Co. and I have been told that Maj. Emmons shipped back five machines to the United States Aircraft Co.

Senator REED. Where is their factory?

Mr. JORDAN. Redwood.

Senator REED. Who shipped them back?

Mr. JORDAN. Maj. Emmons.

Senator REED. What is Maj. Emmons's first name?

Mr. JORDAN. Delas Emmons, at the Mather Field. He not only made that statement to me, but also to Mr. Edgar Williams, the chairman of the Civil Service Commission of the State of California. Here is a telegram from Mr. Williams, in which he says:

Maj. Emmons, commandant of Mather Field, tells me inspection is rotten and they have discovered many glaring defects.

The CHAIRMAN. The committee will now take a recess.

(Subsequently the chairman wired for additional information on this matter, which is here printed in full, as follows:)

WASHINGTON, D. C., July 17, 1918.

Maj. D. C. EMMONS,

Commanding Mather Flying Field, Sacramento, Cal.:

Mr. Jordan, of Sacramento, testified this morning before the Senate Subcommittee on Military Affairs that you said to him in substance about June 25 that training planes coming in were rotten; that you had been repairing them in your own field; that a vital part of the machine is the little belt pull controlling the after rigging, the elevator, and the after part, which you had to reinforce by placing tubing inside of same; also that you soldered up and put plates on the side of the rocker arms; also that you returned to the United States Aircraft Co. at Redlands five machines delivered to your field. Please forward copy of your record regarding this subject, together with statement covering the subject fully and oblige Senate Subcommittee on Military Affairs.

C. S. THOMAS, Chairman.

WAR DEPARTMENT,
SIGNAL CORPS AVIATION SCHOOL,
MATHER FIELD,
Sacramento, Cal., July 19, 1918.

From: Maj. Delos C. Emmons, Air Service, National Army.

To: Senator C. S. Thomas, chairman of Senate Subcommittee on Military Affairs.

Subject: Statement concerning conditions of airplanes delivered to Air-Service School, Mather Field, Sacramento, Cal.

1. In compliance with your telegram dated July 17, 1918, copy attached. I am inclosing herewith a statement covering in detail just what faults were discovered with every airplane assembled at this field and including other faults

which were present but not discovered until the airplanes had been flown. I hope this statement includes the information desired by the Senate Subcommittee on Military Affairs.

2. The first part of my statement is intended to correct that part of Mr. Jordan's testimony in which I am quoted. The second part is a compilation of plane-inspection reports and trouble reports.

3. In this connection it is desired to state that flying began at this school on June 17, 1918; that approximately 50 different airplanes have flown approximately 150,000 miles without serious injury of any kind to either pilots or passengers.

DELOS C. EMMONS,
Major, Air Service, National Army.

WAR DEPARTMENT,
AIR SERVICE TRAINING STATION MATHER FIELD,
Sacramento, Cal., July 19, 1918.

1. I hereby certify that Mr. John A. Jordan, ex-vice president and general manager of the Liberty Iron Works of Sacramento, Cal., which company had manufactured and delivered to this school 12 airplanes visited my office at Mather Field, Sacramento, Cal., on or about June 25, 1918, and offered his assistance as an aeronautical engineer; that during my conversation with Mr. Jordan I stated to him that some of the airplanes delivered to this field were in rotten condition, meaning that they were unsafe to fly. I also stated to Mr. Jordan that certain weak or defective parts were being replaced at this school and that certain repairs were being made at the Liberty Works of Sacramento, Cal.

I further stated to Mr. Jordan that on many of the airplanes supplied the elevator-control assembly, a vital part of the airplane, was weak and that I was having these parts reinforced before permission would be given to fly the airplanes.

I did not state to Mr. Jordan that we were soldering up and putting plates on the side of the rocker arms. However, I did state that, as soon as it could be arranged to do so, rocker arms would be cast at this school which I believe would be stronger than those supplied.

No airplanes have been delivered by the United States Aircraft Co., Redwood, Cal., to this school. Six surplus airplanes delivered to this school in error were returned to the Fowler Aircraft Corporation, San Francisco, Cal.

2. I further certify that the attached report, compiled by the Post Engineer Officer, covering in detail just what faults have been discovered with the airplanes assembled at this school, is correct to the best of my knowledge and belief, as I have personally observed many of the faults enumerated.

DELOS C. EMMONS,
Major, Air Service, National Army, Commanding.

MATHER FIELD, *July 19, 1918.*

Memo to commanding officer:

1. I submit the following report of trouble and faults found on ships assembled to date, along with subsequent faults that developed after flying.

2. The first in order are the twenty-four hundred series airplanes, manufactured by the Fowler Airplane Corporation, of San Francisco, Cal., as follows:

Ship No. 2405. Fuselage warped, necessitating realignment; cross member safety wire on turnbuckle very loose.

Ship No. 2406. Fuselage warped, necessitating realignment; short right-upper elevator control wire; one outer-left flying wire missing; one aileron-control wire not soldered at thimble.

Ship No. 2407. Fuselage warped, necessitating realignment; loose safety wire on turnbuckles of compression strut brace wires in fuselage; axle stream line space bar cracked; wooden control stick loose in socket; wing-struts fittings twisted; elevator and aileron-control wires too short; engine bed cross member cracked. Ends of this cross member very loose in master strut. Space had been filled with $\frac{1}{8}$ wooden wedge, which loosened and dropped out.

Ship No. 2408. Fuselage badly warped, necessitating realignment.

Ship No. 2409. Elevator and aileron-control wires too short; one end of aileron-control wire was not soldered at the wire wrapping below thimble.

Ship No. 2410. Elevator control wires corroded so that rust could be scraped out from between wires with a pen-knife; rudder control wires improperly soldered at thimble so that wire wrapping at thimble was flexible and easily bent; elevator control wires too short; right front brace on landing gear split; clevis pin was in clevis on elevator pylons instead of bolt, nut, and cotter; cotter pin hole in bolts on wing skid sockets improperly drilled, so that cotter pins could not be used.

Ship No. 2413. Fuselage warped, necessitating realignment; no safety wire on turn-buckle on internal brace wire; fuselage clevis pins rusted; motor bed cross bearer compression member too small for mortised hole in master strut No. 3; then wooden wedge used fill space.

Ship No. 2414. Fuselage warped, necessitating realignment; one dead wood wing strut.

Ship No. 2416. Wood control stick loose over taper socket; one aileron control wire thimble not soldered.

3. The second in order are the thirty-six hundred series of airplanes, manufactured by the Curtiss Airplane and Motor Corporation, of Buffalo, N. Y., as follows:

Ship No. 3621. Fuselage warped, necessitating realignment; base of forward cabane on right wing beveled in wrong direction where it fit in socket, necessitating replacement.

Ship No. 3626. Turnbuckle eye on landing-gear brace wire improperly threaded, necessitating replacement; left rear landing gear strut $\frac{1}{4}$ inch short; ailerons not varnished.

Ship No. 3628. Left front landing gear strut $\frac{1}{4}$ inch short; wing strut dead wood; one right lower wing strut fitting too far ahead on wing section; brace wire loop between sections 6-7, right side of fuselage, found broken; right front landing gear strut $\frac{1}{8}$ inch too long.

Ship No. 3629. One right front flying wire $\frac{3}{4}$ inch too long; left rear landing gear strut $\frac{1}{2}$ inch too long.

Ship No. 3635. Fuselage warped, necessitating realignment; right landing gear strut $\frac{3}{8}$ inch too long; right aileron warped; left lower wing panel $\frac{3}{8}$ to $\frac{1}{2}$ inch more camber than right wing panel.

Ship No. 3637. Fuselage warped, necessitating realignment; Pyrene extinguisher empty.

Ship No. 3644. Fuselage warped, necessitating realignment.

Ship No. 3652. Rudder badly warped; was replaced; fire extinguisher leaking.

Ship No. 3653. Fuselage warped, necessitating realignment. One outer left panel strut $\frac{1}{8}$ inch too long; linen torn near leading edge on four wing panels, and on stabilizer; rawhide guide on elevator control wire torn out of fuselage.

Ship No. 3655. Right front and right rear landing gear struts $\frac{3}{8}$ -inch too long; horizontal stabilizer warped.

Ship No. 3656. Left front inside flying wire $3\frac{1}{2}$ inches too long.

Ship No. 3657. Aileron control wires short; bolt on rear seat support broken; replaced.

Ship No. 3660. Left aileron warped.

Ship No. 3661. Four false ribs on trailing edge of lower wing broken, necessitating repairs; fuselage warped, necessitating realignment.

Ship No. 3663. Loose fittings on lower wing panels throughout; left aileron warped.

Ship No. 3664. Fuselage warped, necessitating realignment.

Ship No. 3668. Fuselage warped, necessitating realignment.

Ship No. 3670. Turnbuckle on right stagger wire, center section, missing.

Ship No. 3671. Stabilizer warped; pyrene leaking.

Ship No. 3672. Left aileron $\frac{1}{4}$ -inch short; vertical fin warped.

Ship No. 3674. Right front center section strut too short; left rear center section strut too short; left aileron badly warped.

Ship No. 3675. Could not obtain proper stagger due to center section struts being improperly beveled at their base, thereby bottoming in the socket; left rear center section strut $\frac{1}{4}$ -inch short.

Ship No. 3678. Right lower wing panel leading edge badly warped; turnbuckle eye or shank undercut, and loose in turnbuckle; replaced.

Ship No. 3679. One wing strut warped; replaced.

Ship No. 3680. Left aileron warped.

Ship No. 3681. Wing hinge fitting on upper left wing fitted too high on wing section and affected dyhedral and angle of incidence; one front flying wire 12 inches too long.

Ship No. 3682. Fuselage warped, necessitating realignment; one stagger wire 1 foot and 5 inches too long.

Ship No. 3684. Left rear landing gear strut $\frac{1}{2}$ -inch too long; right front landing gear strut $\frac{3}{8}$ -inch too long.

4. The above detail report of troubles in assembling were compiled at time of assembly, and, in many instances, trivial defects are noted, as our men are required to check up every part of the ship and report anything unusual.

5. The third in order are the 10 Liberty planes of the thirty-nine hundred series, numbered 3991 to 4000, inclusive, manufactured by the Liberty Iron Works, Sacramento, Cal.; these ships were delivered to the field and partially assembled by their workmen.

These were the first ships put in commission, and, owing to the lack of department organization, defects were not reported by ship number. After the résumé of troubles was taken and was corrected by our mechanics who had charge of final inspection, they were placed in flying service.

The following general defects, however, were noted:

The fuselage bolts to the rear of station 6 were not cotter pinned, but the prick punching was of higher order than in the Fowler; control sticks were very loose in their sockets, and in some cases bottomed on the toggle joint on shaft underneath; carburetor control levers were connected in the opposite direction from the usual practice of a forward motion to open; clevis yokes on aileron and elevator control links were very loose; doping and varnish were generally poor on both wing and fuselage, and in some cases seemed to have but one coat of very thin varnish; wires seemed to be not properly stretched or tested by manufacturer; after first flight, loose landing, flying and drift wires developed; landing gear wires were connected to struts by means of eyebolt through struts at improper angle to correspond with angle of the brace wire, causing the eyebolt to bend under the usual stress and strain. Fowler and Curtiss planes had no such defect, inasmuch as they employed an extended lug bent to the proper angle.

Common complaints after ships have had flying service:

Gasoline tanks.—Up to date gasoline tanks in the following ships, to wit: Nos. 3612, 3640, 3657, 3664, and 3677, manufactured by Curtiss Airplane Corporation, and Nos. 3993, 3998, and 4000, manufactured by Liberty Iron Works, are opening up or cracking along the riveted seam. In every instance this has been at the sides about 8 inches up from the bottom. This may be caused by grade of metal used, method of riveting, or expansion and contraction of the sides of the tank by action of gasoline within. This fracture occurs between two lateral felt-lined wooden strips used as spacing members, apparently, to retard this expanding or contracting motion or vibration. Consequently we are making an additional spacing member to prevent the inward and outward action of the metal, which may prevent further fractures at this point. However, it is our general opinion that the design is faulty, and we should not rely on the stick strip to prevent such action as causes this fracture.

Bent axles.—1. Axles on the following ships have bent under the usual shock on landing: Ships 2406, 2410, 2415, and 2416 of the Fowler Airplane Corporation of San Francisco, Cal. Ships 3612, 3665, and 3669 of the Curtiss Aeroplane & Motor Corporation of Buffalo, N. Y. Ships 3996 and 4000 of the Liberty Iron Works of Sacramento, Cal.

2. Some of these axles have been straightened cold and do not appear to be of the proper grade of metal, as they continue to bend.

3. Samples of axles are now being examined by Mr. J. H. Howell, chief engineer of the San Francisco district, Bureau of Aircraft Production, San Francisco, Cal.

Wood control sticks.—Wood control sticks were used in both the Fowler and Liberty airships. Are constantly being refitted. They seem to shrink and loosen under service.

Landing gear struts.—1. Of landing gear struts broken to date, eight have been found dead wood in ships 3996 and 4000 of the Liberty Iron Works.

2. As you will note in the "Ship Assembly Report," a great many of these landing gear struts are found short. This holds good in all three makes of machines at this field.

Inner plane struts.—A great many of these struts have been found to be too short on all three makes of airplanes.

Longerons.—1. Fowler ship 2408 turned over and upper ash longeron between station No. 6 and No. 7 broke. Sample of wood now in hands of district office, Bureau of Aircraft Production, San Francisco, for examination.

2. Fowler people have replaced all No. 6 and No. 7 struts on their ships with ash at this field.

3. The breaking of this longeron proved where wood screws were used to spread metal seamings in position on longerons. These screws were unnecessarily large and extreme length. One break took place at a place where two wood screws were on a line through the cross section undoubtedly weakened the member.

4. No. 6 and No. 7 vertical spruce struts broke and showed evidence of insufficient strength at this point.

5. Mr. H. A. Hamm, district wood engineer, advises us that after investigation it has been necessary to use ash or oak at this station.

Fuselage at station No. 5.—1. It has been found that ordinary tension brought upon the landing gear wires which terminate directly under station No. 5 caused twisting of the lower longeron at this point.

2. Investigation proved that a compression strut was necessary in addition to the steel compression member which is located above the longerons, installed at the right point to prevent the longerons springing under strain.

3. Engineer Howell, of the district office, Bureau of Aircraft Production, San Francisco, has agreed upon this point and has ordered the manufacturers of this district to provide this extra compression member.

Wings warping.—1. Internal drift wires were found loose on the following ships: 2405, 2407, 2409, 2414, 2415, and 2416 of the Fowler manufacture.

2. Fabric ripped open showed wires lay slack. Mechanics of this field and the Fowler Aircraft Corporation are adjusting these wires.

3. W. W. Norton, senior inspector at the Fowler factory, states: "Internal wing wires have been examined and found still too loose."

4. "Wings in planes 2415 and 2416 bear the stamp of the California Aviation Co. of Los Angeles, by whom they were made. Almost all the Fowler planes carry one or two wings made by this concern."

5. "Requested that Fowler company send men to correct this fault." Request granted.

Propellers.—1. The Jacuzzi propellers were very poorly varnished and seemingly made of a soft wood which is susceptible to injury on contact with earth thrown up when warming up motor.

2. In some instances the laminations have parted and do not stand but very little service. Copper tipping would possibly prevent this, but it is the general opinion that the fault lay in the process of gluing.

Switches.—1. Motor in ship 3632 went dead at low altitude, causing a forced landing, wrecking the plane.

2. It developed upon investigation that the magneto circuit had become grounded. Upon examination of switch it was found that the primary lead or live wire from the magneto to the switch wire, attached to the center binding post of the switch, had come in contact with a small spiral spring on side, this spring being grounded to the body of the switch. The circuit traveled along the rod-connecting switch, touching the brace wire where the ground connected along the steel-wire electric conduit to motor base.

3. It is necessary in order to prevent a recurrence of this trouble to lead the ground and dead wire to center terminal, and would suggest that switches be more adequately insulated.

Fuselage brace wires.—1. Loops on fuselage brace wires on Fowler planes are of a different shape than those of Curtiss manufacture and are much narrower across the loop. The opinion is that when wire stretches the lower portion of loop slides into the sleeve. However true this may be, many wires were found loose after short service.

Control wires.—1. Control wires on Fowler, Curtiss, and Liberty planes have been found too short in coupling; turnbuckle wires were drawn so tight that operation became difficult.

2. Would suggest that threads in all eyebolts entering turnbuckle be made of sufficient length to accommodate variation of alignment. The end of this thread section can then be cut off where they bottomed.

Center-section struts.—Center-section struts in both Curtiss and Fowler planes have come either too short or too long, causing considerable difficulty in alignment.

Ship's nose heavy.—1. Ship 2417, Fowler Corporation, was found nose heavy and could not be corrected by stagger.

2. The Fowler Corporation sent mechanics from San Francisco to attempt to correct fault by moving motor bed but finally gave it up.

3. Upon investigation we found that station No. 4 was five-sixteenths of an inch too far to the rear. Some radical change will have to be made and station No. 4 moved to proper place. As yet nothing has been done.

4. Would recommend that plane be shipped back to Fowler Corporation for correction.

Frayed wires.—1. Nearly all control wires, especially ailerons, become frayed inside of 40 hours' service.

2. This condition required completely changing guides installed to rawhide-lined fittings.

3. The Fowler and Liberty concerns are now both changing to rawhide guides accordingly.

Elevator-control assembly.—1. Very poor design and construction is apparent on this member of all three models, Fowler, Curtiss, and Liberty.

2. This was one of the most serious defects we found in construction of planes.

3. This member is constructed from thin tubing as a cross member, with a double-lever bell crank on both ends where the wire cables are attached, operating the elevator. This member is back of the rear seat. A center lever is employed to connect with the control stick. Considerable force is brought to bear upon this center lever in operating elevators. This lever is of frail construction, made up of thin sheet steel, terminating with a ball-drop forging.

4. In the Liberty ships this ball drop forging is joined to the lever with one single rivet in addition to very light spot welding.

5. The lever itself is fastened to the tubing with a single taper pin. This lever becomes loose after the first flight on these machines through the taper pins loosening and wearing in the thin support from the steel tubing.

6. This matter was taken up immediately with the chief engineer of the Liberty Iron Works, Mr. McManus, who stated that he had broken the spot welding on this part with a sharp blow, not on the lever, but on the tubing adjoining.

7. We immediately dismantled all cross levers on the 10 Liberty ships we had on this field. The ball joints were repinned and brazed to the lever and the lever repinned and brazed to the shaft. In addition a reinforcement of extra tubing was inserted inside the original tubing.

8. Later the thin side plates of which this lever was constructed sprung in service, and this part is also reinforced either by brazing a reinforcement of sheet metal or making a hardwood block, bound with linen and taped.

9. The alteration of this part has been authorized by the district office, Bureau of Aircraft Production, at San Francisco, Cal.

I, S. C. Coon, Captain A. S. S. R. C., engineer officer, Mather Field, Sacramento, Cal., do hereby certify that the above statement of faults and defects in aeroplanes is correct in every detail to the best of my knowledge and belief.

S. C. COON,
Capt. A. S. S. R. C., Engineer Officer.

(Whereupon the committee took a recess until 1.30 o'clock p. m.)

AFTER RECESS.

At 1.30 o'clock p. m. the committee reassembled, pursuant to the taking of recess.

STATEMENT OF MR. A. A. D. LANG.

Senator NEW. Mr. Lang, state your name and address.

Mr. LANG. A. A. D. Lang, New York City.

Senator NEW. You are engaged in business where?

Mr. LANG. Jamaica, Long Island, and Whitestone, Long Island, N. Y.

Senator NEW. What line of business?

Mr. LANG. Making and designing airplane propellers.

The CHAIRMAN. How long have you been in that business?

Mr. LANG. I have been making airplane propellers since 1909.

The CHAIRMAN. Where did you first begin the work of making propellers?

Mr. LANG. In England, sir.

The CHAIRMAN. You are a native Englishman, are you?

Mr. LANG. I am. I have been in this country only a little over a year.

The CHAIRMAN. Were you engaged in the making of propellers in England?

Mr. LANG. Yes, sir.

The CHAIRMAN. When did you come to this country?

Mr. LANG. I arrived in this country on the 12th of May of last year.

The CHAIRMAN. Under what circumstances did you come here?

Mr. LANG. I was manufacturing airplane propellers in England and I had a plant which still bears my name and is still manufacturing airplane propellers for the British Government. There was a slight difference between the people with whom I was associated and myself. I started this plant with two men and a boy. In those days airplane propellers were not required in quantities and I was doing experimental work, and not manufacturing. The war came on and the business grew to about 500 men, and the business was then—I am an engineer and not a business man—and the result was I had to just leave it. I was going into the British Army and I was advised to see Col. Lassiter, and I went to see him and he thought it was an extremely good idea for me to come to this country, and I went to the Director of War Organizations at the War Office in London, and he wrote this letter to me. He says:

The bearer was the founder and original proprietor of the Lang Propeller Works, which is now a highly successful enterprise, and is patronized by the Royal Flying Corps. He can explain his position. It occurred to me that he might be a good free agent in the event of this Government requiring any assistance in this country or on the other side.

GEN. CHARLTON.

Col. Lassiter gave me a letter with this inclosing a letter to Gen. Squier. I arrived in Washington on the 28th of May last year, and I endeavored to see Gen. Squier and he was not there, and it was simply that I was unfortunate. I did meet Col. Waldon, through a personal friend, and altogether spent three days with him. On the last day I met Col. Deeds but did not meet Mr. Coffin at that time. I produced all these letters, of which I have quite a sheath here, explaining that I am in my way an expert propeller maker and designer, and they told me that they had plenty of propellers and did not require any and what did I want? And I said that I wanted nothing in particular but I might be of assistance to them if they would like to give me a position of any kind; that I would be very pleased to take it. I could supervise aircraft production. I offered them my services for anything they would like to give me as inspector or designer or manufacturer under the Aircraft Production Board.

The CHAIRMAN. As a manufacturer of propellers?

Mr. LANG. Yes, sir; or in any other sphere which had purely to do with propellers. They told me very politely that they did not require my services, but if they did they would let me know, but they did not even take the address. I left Washington and went to Canada, and was there given a certain amount of interesting interviews with certain people up there. Gen. Horne gave me an order and contract for 200 propellers right away, and those I manufactured for the Canadian Airplanes (Ltd.).

The CHAIRMAN. Did you make them in Canada?

Mr. LANG. No, sir; in New York, on Long Island. I was training men all the time against the time when I imagined the propellers would be required. On about the 14th of August—I did not bring the papers with me, because I did not know what your committee wanted me for—I was sent for by telegraph to see a Maj. Sligh—Maj. Chapres R. Sligh.

Senator NEW. By whom were you sent for?

Mr. LANG. By Maj. Charles R. Sligh.

Senator NEW. In Washington?

Mr. LANG. About the 14th of August, 1917.

Senator NEW. Tell us what Maj. Sligh's duties were.

Mr. LANG. He was in charge of the purchasing of materials of wood for anything apparently made purely of wood, and he was in charge then of propeller purchasing and production, and he was made a major. He was first of all Mr. Sligh and on or about the 14th he had received the rank of major. I came down to see him and he said, "Are you prepared to manufacture propellers?" and I said, "Yes, I am." He said, "Do you need any finance?" I said, "No, thank you. I have arranged for finance in New York." And he said, "How deeply have you arranged for this finance?" and I said, "It is all arranged. There is nothing to be said about it." He said, "That is a pity. If you wish to go to Grand Rapids, Mich., there are some bankers there who would be very glad to meet you."

Mr. W. F. ARDIS (treasurer of the Lang Propeller Co.). Was this a propeller concern in Grand Rapids?

Mr. LANG. No; it was purely a woodworking plant that could go very easily into the manufacture of propellers. I told him I was extremely sorry, but could not do it. He said I had better think it over. "We can quote anything up to a million in capital." "You can take a train and arrive there in two or three days," he said, "and they will be pleased to meet you and show you the place," etc. I have since learned, but I can not swear to it, but I believe the name of the plant was the Sligh Furniture Co. I told Mr. Sligh that I could not go. I told him I could not go because I had already made my arrangements in New York. We were already manufacturing these propellers.

Senator REED. You had learned the fact to your own satisfaction but you can not swear to it. Please tell us upon what you base that opinion. Tell us your authority for it.

Mr. LANG. A lumber dealer named J. O. Stewart came down to our plant at Jamaica.

The way the matter came up was this: that the old Sligh Furniture Co., of Grand Rapids, had been turned into a propeller plant and it had a large order for something like 8,000 propellers.

Senator REED. You are going to tell us how you got this information. Somebody came down there?

Mr. LANG. He said, "Have you got many orders here?" I said, "No; I have, practically speaking, no work to do at all." I was doing, I think, four experimental propellers at the time for the Signal Corps and I think that was why he was in the plant. He said, "Other plants seem to have plenty of work," and I asked him if he knew the names of the plants, and he said that as far as he could gather it was the Sligh Furniture Co., and they were getting these large orders. I had received no orders at all from the Signal Corps at the time. I heard nothing more at all from the Signal Corps at the time. I heard nothing more at all from Maj. Sligh, I should say, for two months, that would be about October or September. In the meantime I had got some orders for about, probably not more than a dozen experimental propellers for the Navy Department, and I was doing this and wanted some lumber, and I had purchased a carload of lumber which was coming through from the West, and I was informed that Maj. Sligh was the right man to give me assistance to get this carload through. His reply was, as I had no contract from the Signal Corps, he could not give me any assistance in getting the lumber. But I afterwards got it through.

Senator REED. Did you tell him that you had contracts with the Navy?

Mr. LANG. Yes, sir. We had quite a correspondence about it.

Senator REED. Could you get those letters?

Mr. LANG. Yes, sir.

(The matter referred to by Senator Reed was subsequently submitted and is here printed in full, as follows:)

COUNCIL OF NATIONAL DEFENSE,
AIRCRAFT PRODUCTION BOARD,
Washington, July 31, 1917.

LANG PROPELLER Co.,
280 Madison Avenue, New York City.

GENTLEMEN: It is possible that this board may desire to contract for propellers independently of aircraft manufacturers. If you have facilities for manufacturing these, we will be pleased to have you file with us immediately a statement of what your facilities are, which should state what your factory facilities are and also your financial ability and your experience; how many thousand you could manufacture a year and your price for different woods in birch, quartered sawed oak, walnut, and mahogany.

Very truly, yours,

AIRCRAFT PRODUCTION BOARD,
By CHAS. R. SLIGH.

NEW YORK CITY, *August 6, 1917.*

COUNCIL OF NATIONAL DEFENSE
(AIRCRAFT PRODUCTION BOARD).
Washington, D. C.

Attention Mr. Charles R. Sligh.

GENTLEMEN: We thank you for your letter dated July 31 in regard to the possible requirements for aeroplane propellers in the near future.

We have perfected our plans for the manufacture of propellers and have incorporated under the name of the Lang Propeller Co. of America (Inc.) and will commence business with a paid-up capital of \$50,000. At the present moment we have our works at Southampton, Long Island, which we are using largely for experimental purposes and for training workmen for the peculiar needs of our business.

We are investigating the suitability of several localities in or near New York which we shall equip with machinery now on order. The size of the plant we have in view will depend entirely upon the demand that shall exist for our product.

We already have submitted one or two sample propellers to the Canadian Government, who have asked us to be prepared to furnish large quantities of propellers to them for their schools in Canada. If your board is likely to require propellers in quantity it will materially affect the plant we propose taking over and our general scheme will have to be slightly reorganized from its present lines. The writer spent three days toward the end of May in Washington and endeavored to discover what the prospect might be for propellers, and your letter of July 31 is the first and only intimation regarding the situation we have had from Washington.

We are prepared and can immediately start preparing for whatever production may be required and can make firm promise for 10,000, 15,000, and up to 25,000 propellers per annum. Should a greater number than this be required we can within a very short time enlarge our manufacturing facilities to meet such demand.

The writer is the founder and originator of the Lang Propeller (Ltd.) (of England), which is probably one of the largest concerns of its kind in the world, and it is fair to say that upward of 60 per cent of the propellers now used in the Royal Flying Corps and the Royal Naval Air Service bear the writer's name at the present moment. The writer has letters which he shall be pleased to submit to your board from various officials in London that will establish his status.

The writer has spent the past seven years exclusively to the design and manufacture of aeroplane propellers, and until the early part of this year has been in full charge of the Lang Propeller plant at Weybridge, England, which is still in operation and bears his name.

Regarding the price of propellers, it is somewhat difficult at this particular moment to quote definite prices, due to the lack of knowledge of Government specifications and requirements; also the difficulty in arriving at the best timber to adopt, due to the scarcity of mahogany and walnut now prevailing. At the moment we are carrying out tests on various grades of American timber, which is abundantly available, and will be glad to let your board know in detail when we have satisfied ourselves as to the results of these tests and what we consider can be used advantageously. We are now endeavoring to get prices on walnut and mahogany, but our wide experience in using the timber that is kiln dried and insufficiently seasoned force us to the conclusion that it would be inadvisable to use any timber that can not be procured in quantity, dry, and ample to meet the demand for immediate use.

We might also mention that the writer has spent considerable time in arriving at satisfactory glues, methods of inspection, jigs, etc., which will facilitate the manufacture of Lang propellers in this country, and no doubt the writer's very wide experience, when called upon, would be of service in his chosen line.

Awaiting with interest your further communications,

Yours, faithfully,

LANG PROPELLER CO. OF AMERICA (INC.).

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, August 9, 1917.

Mr. A. A. D. LANG,
30 East Forty-second Street, New York City.

DEAR SIR: Yours of the 6th has been received. If possible, I would like to have you come over here and see me personally, as I think I am in position where I can put you in touch with the people who have the factory facilities already and will put up anywhere from \$100,000 to \$150,000, if necessary, in engaging vigorously in the manufacture of propellers.

Please advise me by wire if you are coming and when. I will be in the city up to 2 o'clock Saturday and will not be back until Monday morning at 9 o'clock, but I would prefer to see you to-morrow evening if possible.

Very truly, yours,

CHAS. R. SLIGH.

NEW YORK CITY, August 30, 1917.

COUNCIL OF NATIONAL DEFENSE,

*Office of the Chief Signal Officer, Aircraft Production Board,
Washington, D. C.*

Attention of Mr. Charles R. Sligh.

GENTLEMEN: You will probably recall the writer and Mr. Lang visiting you some two weeks ago. Since then we have arranged for the manufacture of propellers in quantity.

We shall be glad to know the requirements of the United States Government, as we are now negotiating a contract with the Canadian Government, and feel that the United States should have the first call upon us.

We understand from our last conversation that the only propellers the United States Government is buying at the present time in quantity are for the Curtiss type JN machine.

We await with interest your early response, and beg to remain,

Very truly, yours,

LANG PROPELLER CO. OF AMERICA.
Per _____.

WAR DEPARTMENT.
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 6, 1917.

From: Maj. Chas. R. Sligh.

To: Lang Propeller Co. of America, 30 East Forty-second Street, New York City.

Subject: Propellers.

1. This division has decided that it was advisable to make its contracts with companies who have an organization and an established factory with facilities to justify our orders, and all the orders available at present have been disposed of this way.

2. If at any future time you have the facilities for doing this, we will take the matter of contract up with you later.

CHAS. R. SLIGH,
Major, Signal Corps.

NEW YORK CITY, September 6, 1917.

COUNCIL OF NATIONAL DEFENSE,

Aircraft Production Board, Washington, D. C.

Attention of Charles R. Sligh.

GENTLEMEN: We have issued order for one carload of Philippine mahogany to S. S. Spiro, to be shipped from San Francisco to New York City.

This mahogany is for aeroplane propellers, both for the Government and for other manufacturers building aeroplanes for the Government.

We understand you issue a special order to the railroad to rush shipment through to its destination. If possible, would appreciate this order at an early date as convenient.

Very truly, yours,

LANG PROPELLER CO. OF AMERICA.
Per L. T. MORLAND.

Our order issued to S. S. Spiro, 505 Fifth Avenue, New York City.

WAR DEPARTMENT.
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 7, 1917.

From: Maj. Charles R. Sligh.

To: Lang Propeller Co. of America, 30 East Forty-second Street, New York City.

Subject: Shipment of mahogany from San Francisco to New York City.

1. We have your favor of the 6th instant, in reference to shipment of mahogany from San Francisco to New York City. We are not aware that you are under contract with the United States Government to furnish propellers, and therefore we could not consistently put out any orders to facilitate the movement of your particular freight.

Yours, very truly,

EQUIPMENT DIVISION,
CHAS. R. SLIGH,
Major, Signal Corps.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 17, 1917.

From: Maj. Charles R. Sligh.

To: Lang Propeller Co., 30 East Forty-second Street, New York City, N. Y.

Subject: Purchase request for four propellers

1. We are issuing to-day through this office purchase request for four propellers; one each from the following drawings: 8-27, 8-29, 8-30, 8-31, of which blue prints are attached to the order. This purchase request is issued at the request of Lieut. Col. V. L. Clark.

2. The above propellers are to be right-hand screws and to be made in accordance with specifications No. 29500. As this is an emergency order we request that you proceed immediately with the manufacture of these propellers and that you immediately reply to us, stating your price for the same.

By direction of the Chief Signal Officer.

CHARLES R. SLIGH,
Major, Signal Corps.
By G. E. L.

OCTOBER 19, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).

To: Maj. Charles R. Sligh, Signal Corps.

Subject: Purchase request for four propellers.

1. We have your communication of October 17 containing purchase request for four propellers, issued by direction of the Chief Signal Officer at the instance of Lieut. Col. V. L. Clark.

2. We respectfully invite your attention to our communication of August 30 to you and your reply thereto of September 6; also to our communication of September 6 to you and your reply thereto under date of September 7.

3. In the interim we have closed additional contracts with the British and the Canadian Governments and various manufacturers who are building planes for the United States Government.

4. Therefore, much as it would delight us to comply with a purchase request issued by direction of the Chief Signal Officer at the instance of Lieut. Col. V. L. Clark, we are obliged to decline this purchase request transmitted by you and shall return the formal order if and when received.

GENERAL MANAGER.

OCTOBER 24, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).

To: Capt. A. C. Downey, Signal Corps.

Subject: Order for four 4-blade propellers.

1. We respectfully invite your attention to our communication of October 17, 1917, addressed to Maj. Charles R. Sligh.

2. We also invite your attention to the fourth paragraph of the above-mentioned communication, and in accordance therewith we are returning under separate cover your department order for four 4-blade propellers, No. L20145, with blue prints attached.

GENERAL MANAGER.

OCTOBER 27, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).

To: Lieut. Col. V. L. Clark.

Subject: Specially designed propellers.

1. This office is in receipt of your communication addressed to Mr. Dashwood Lang of October 26 regarding the designing and building of some propellers for the United States 12-cylinder 400-horsepower engine, to be mounted in the D. H. 9 Bristol fighter.

2. It will give this company great pleasure to be of any assistance to you in the design and development of a suitable propeller for the 12-cylinder motor mounted in the D. H. 9 machine.

3. We request that you fill out the inclosed inquiry blank, upon receipt of which we will expedite manufacture and shipment with the least possible delay.

GENERAL MANAGER.

WAR DEPARTMENT.
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 26, 1917.

From: Office Chief Signal Officer.
To: Lang Propeller Co., 30 East Forty-second Street, New York City.
Subject: Cancellation of order No. 20145.

1. With reference to your letter of October 24, 1917, and your letter of October 17, 1917, addressed to Maj. Charles R. Sligh, setting forth your inability to undertake work for the Signal Corps at this time, you are advised that order No. 20145 is hereby canceled.

By direction of the Chief Signal Officer.

A. C. WALSER.
First Lieutenant, Signal Corps, U. S. R.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 26, 1917.

From: Office Chief Signal Officer.
To: Mr. Dashwood Lang, care of Lang Propeller Co., 30 East Forty-second Street, New York, N. Y.
Subject: Propellers.

1. This office would be interested in a proposition relating to your designing and making up several propellers for the U. S. 12-cylinder 400-horsepower engine as mounted in the D. H. 9, and in the Bristol fighter.

2. It is suggested that a satisfactory arrangement might be for this office to purchase two propellers of each of several designs, the purchase price of the two propellers being sufficient to cover the expense incurred in the design in each case.

3. It is requested that you communicate with the undersigned at the aeronautical experimental station, Signal Corps, McCook field, Dayton, Ohio.

By direction of the Chief Signal Officer.

V. E. CLARK.
Lieutenant Colonel, Signal Corps.

Mr. LANG. I have done quite a great deal of experimental work. I have made quite a number of propellers, both for the Army and the Navy Departments, and now I have a pure cost-plus plant working entirely for the Navy, and the Jamaica plant is to-day out of work, and it is on the point of being shut up with 100 extremely skilled men, and I have reason to believe that our work is as good or better than others in this country.

Senator REED. Have you told us all the reasons that you have to think that this Sligh concern was the one which was being referred to by Maj. Sligh?

Mr. LANG. It has been mentioned so many times to me by so many people that it was so. It was small talk but I attached that much importance to it; I had every reason to believe it was so.

Senator NEW. Did you receive any orders from the Signal Corps since Maj. Sligh was connected with the service?

Mr. LANG. Not through Maj. Sligh. I received, I think, an experimental order for three propellers through a major or captain who is doing experimental work that did not come through Maj. Sligh's bureau.

Senator REED. Do you remember that man's name?

Mr. LANG. I think it was Capt. V. E. Clark, probably he is now Gen. Clark. That was just for one or two experimental propellers.

Senator REED. Has there been any complaint about the character of the work you have done?

Mr. LANG. One propeller we made burst at Pensacola back in March, I think it was. That situation has been cleared up, and I am not held criminally negligent by the Navy in any way for the workmanship. I went down to Pensacola last week and straightened up the work there. This is the only time anybody can criticise any of our work.

Senator REED. What was the story of that?

Mr. LANG. The Navy Department has a number of flying boats coming out, and had no propellers for them and called upon us to do the experimental designing upon these propellers, which we did do. Before we could test any propeller at all I was given, of course, the power curve of the Liberty motor to work to, and the power curve of the Liberty motor in December and January was one day at one place and at a different place the next day. It was still in its experimental stages and the motor was varying very much in power. It was 300-horsepower at 1,600 revolutions and 300-horsepower at 1,800 revolutions, and this propeller went down to Pensacola, and whether or not the motor had any more power than the power curves showed I do not know, but the propeller went up to 1,856 revolutions and the propeller burst. All those designs have been since rectified, and I am in very close touch with the Bureau of Steam Engineering. No work I have ever done for the Army can be criticized adversely.

Senator REED. As I understand your statement in regard to the propeller you made in the first place, you were required to make an experimental propeller?

Mr. LANG. Yes, sir.

Senator REED. I suppose that in making that experiment the idea of the designer is to get a propeller that will take hold of the maximum amount of air on a revolution and yet have the propeller stand the strain.

Mr. LANG. Exactly.

Senator REED. You get the factor of safety reduced pretty low. You do not have a very large factor of safety?

Mr. LANG. No, sir.

Senator REED. Because, like building an engine or anything else about an airplane the question of weight and all those things have to be considered. Now, the engine on which this experimental propeller was to be employed was likewise in an experimental stage?

Mr. LANG. Exactly.

Senator REED. And they would constantly get greater power out of it?

Mr. LANG. Yes, sir; all the time.

Senator REED. And since certain parts of that engine broke down when they got additional power it may be that that was the reason and you think it is the reason that your propeller gave out?

Mr. LANG. That is exactly what happened, and it was probably partly due to my design. The design may not have been exact at the time. Propeller designing is very, very difficult to do, though with all the text books that we have to-day it is mostly still a matter of rule of thumb, and the rules to-day are not necessarily the same rules as were in existence six months ago.

Senator FRELINGHUYSEN. Was that a solid or laminated propeller?

Mr. LANG. Laminated, sir.

Senator FRELINGHUYSEN. There was a weakness in the lamination?

Mr. LANG. The burst took place at the hub where the plates join into the hub of the propeller where they are joined to the motor, and that is where all the stresses are concentrated due to centrifugal forces. That is generally where the propeller will burst if it bursts at all.

Senator FRELINGHUYSEN. Were there any fatalities at all?

Mr. LANG. No, sir. I went down and shook hands with the officers who were in the boat when the propeller burst, and so we are friends again.

The CHAIRMAN. How many propellers could you turn out a month if you had an order at your Jamaica plant?

Mr. LANG. We have been doing about 100 propellers a week since about the 1st of February.

Senator NEW. That is, 100 propellers at the Jamaica plant?

Mr. LANG. Yes, alone.

Senator NEW. What is the average number of propellers required for a single-propeller machine, including spares?

Mr. LANG. It should be generally three, including spares.

The CHAIRMAN. That is a minimum number?

Mr. LANG. That is the minimum number for the machine in use in this country. When they are going across the water they can not use anything in them but the best article, and a propeller with a slight blemish which could be used on a training machine would be taken out, so it frequently goes up to five or six.

The CHAIRMAN. But the minimum number is three?

Mr. LANG. Yes, sir.

The CHAIRMAN. Does that hold good with the large machines which are fitted with more than one engine?

Mr. LANG. You generally reckon on three spare propellers for each motor or each power unit.

The CHAIRMAN. So that the number of propellers required is as 300 per cent as compared to the number of planes?

Mr. LANG. Yes, sir; if I might make one criticism. I do not wish to quote matters from the other side, but everybody has to walk before they can run. The whole matter is as I see it, the matter of propeller inspection and production to-day in this country after having been in the same situation exactly on the other side is this: It is not only the same with propellers but with motors and everything else. The inspection is the most vital part of their organization. The inspection in this country at the moment is extremely lax. It is not their fault. It is due to the fact that probably the flying men of to-day—we will say there are 100 flying men and 100 flying machines 18 months ago. They are now numbered in thousands. Each department has to expand, and the inspection department is being equipped to-day and is being gradually got into being, but in the interim we are doing work that I would be most glad to have any criticism on at any time. It has been the policy of the department who are purchasing such things as propellers and airplanes to go out broadcast and take anyone in who has ever seen a piece of wood.

The gentleman who makes this table may make 10 tables and it does not matter to him a bit if those tables vary one-tenth of an inch. The man who is making propellers to-day in this country, most of them, are the men who have been making furniture and many other things which are not as good as furniture. All sorts of

people are making propellers and are making them cheaply and they would not stand inspection. If this matter is put up to the Signal Corps or any other department they will say, "Yes, but Lang Co.'s prices are very high." I contend that the propeller is an article which is subject to enormous stresses and can not be too well made and should not be put out too cheaply. A blue print is handed to 10 different men. They would say, "There is not much in a propeller. It is just glued together, and we can make it for, say \$55, and make a handsome profit." They have gotten those propellers for \$55. They can not get a propeller which is an efficient propeller made efficiently and safely at that price. That is probably what will happen if inquiries are ever made as to why we do not get any work. The Thomas-Morse Aircraft Corporation buy all their propellers from us, and have never questioned our price.

The CHAIRMAN. That establishment is at Ithaca?

Mr. LANG. Yes, Ithaca, N. Y. It is an extremely good firm and it is extremely pleasant to do business with a firm of that type, and they give us all their experimental work and they say, "We are producing a machine and we want you to turn out three propellers," and they get the best material in those three propellers and they say, "What is your price on 300?" And we give them a price, and then they say, "Go on with the work," and they say, "We have never seen any better work." We are not making a million dollars out of it. We are very nearly broke to-day, to show that we are not profiteers.

The CHAIRMAN. What is the character of the wood that you use?

Mr. LANG. I will go back five years ago and say that all propellers were made of black American walnut. It is extremely tough and the tensile strength is higher for its weight than any other wood known. It has many other excellent qualities. It glued very well, due to the construction of the fiber of the wood and we used nothing but black American walnut.

The CHAIRMAN. Is it used abroad?

Mr. LANG. It was used exclusively in England and France until in 1915 they discovered that the call for this other material had grown out of bounds, and we looked around for lumber. The air board in London consulted me and I tried out many kinds of material and we decided that Honduras mahogany or true Mexican mahogany would serve the purpose with almost as good results, although we had to alter the design slightly. Honduras mahogany was easy to procure in 1915 on the other side before the stock of Honduras mahogany being bought for furniture was limited, and the stock had gone away. The British Government has depleted the stock of Honduras mahogany very seriously, and the consequence is we have now to use green wood and dry it. We season it, kiln it. It is extremely difficult to get it kilned.

The CHAIRMAN. Is that Mexican mahogany green mahogany?

Mr. LANG. Green mahogany. Back in October I saw the difficulty of being able to procure enormous stocks at that time of Honduras mahogany. Now, my firm alone is using about 3,000 feet a day alone. So with 100 British firms there is an enormous drain on raw material. I came to this country as a stranger and I learned of a wood called Tanguile mahogany from the Philippines, and I tested it and found that the tensile strength was good and that it was extremely uniform in density, so I had an order for a number of

propellers of tanguile mahogany and they threw up their hands in fear and said the thing was impossible and that it could not be done, and that the propellers would not be accepted.

Senator NEW. You say that you did that with the Signal Corps. With whom was that correspondence?

Mr. LANG. That correspondence finally filtered through to a Maj. Rose. I think he is at Dayton. Most of that was done with Lieut. Ryerson here in the Southern Railway Building.

Senator REED. What became of that?

Mr. LANG. I pleaded with them to use this lumber and said there are enormous stocks of this tanguile mahogany. I suggested that we use it for propellers of 200 horsepower or 150 horsepower, and they said it was perfectly preposterous, and it could not be done, and in the meantime they consulted with their lumber expert in Washington, whose name I think is Williams, and I began to find out that it was extremely difficult to make any headway regarding the mahogany. But the Bureau of Steam Engineering of the Navy said, "We are delighted to hear of it."

In the meantime Ensign Monteith, at the Bureau of Steam Engineering, was extremely glad to do everything he could to help us. We made two propellers out of tanguile mahogany designed for the Liberty motor similar to the propellers we had made from Honduras mahogany. There is a copy of a report in the Bureau of Steam Engineering to the effect that we designed a propeller with a 300-horsepower with a 37 per cent overload for 10 hours, and it showed no signs of fracture or of fatigue. Now, I pleaded for the use of this Philippine mahogany; I am accounted an expert. I designed the propeller, and I should be given more or less consideration in the matter of what to make them out of. I have now, I think, two days ago or three days ago—we got permission on the strength of that spinning test that took place at the Westinghouse Co. to use tanguile mahogany in our Liberty motors. The whole matter seems to be this; it is a pity, I must say. I have a certain amount of knowledge on this subject—to be treated as a naughty boy all the time and told that I do not know anything about it when the so-and-so furniture company can make propellers for \$50 that I can not make them without loss.

The CHAIRMAN. Do you know whether the British and French use this tanguile mahogany?

Mr. LANG. I think they have not even heard of it. It has not to my knowledge ever come to Britain or France.

Senator REED. Of course, if you have really discovered the wood which will do this work, it is a highly important thing. It is a thing, at least, which would seem to me in the present situation that the mere suggestion by a man who has any decent claim to being an expert ought to have been acted on instantly because of its possibilities.

Mr. W. F. ARDIS. In February the word was in the air that our propeller requirements for the 1918 program would require at least 50,000,000 feet of Honduras mahogany.

The CHAIRMAN. Do you mean the American program?

Mr. ARDIS. Yes, sir; for propellers alone. We canvassed the market and situation and found that there was possibly available 5,000,000 feet against this 50,000,000. It was Mr. Lang's contention that every foot of Honduras mahogany which was available in the

country should be conserved for combat machines. At that time we were only making training machines in this country. They were not organized as far as the propeller is concerned, and it was to the end of the conservation of this Honduras mahogany for the combat machines and for the heavier machines in this kind of work that Mr. Lang looked around to find something which would be perfectly suitable for training propeller work, and he put his attention to the making not of combat propellers but of training propellers, for which this tanguile mahogany which he did find was a suitable wood.

The CHAIRMAN. Let me ask about the date of the test of these two propellers which you speak of.

Mr. ARDIS. It was Saturday and Sunday three weeks ago.

The CHAIRMAN. Where?

Mr. ARDIS. At the Westinghouse Co. I was not there. It was done under Navy and Signal Corps observation.

Senator NEW. Are you connected with the Lang Propeller Co.?

Mr. ARDIS. Yes, sir. I am the treasurer of the company.

Senator NEW. You spoke of Mr. Williams here as an inspector in Washington.

Mr. LANG. He is an inspector really, I believe. He is an inspector as much as he is anything else. He says this is to be used and that is to be used.

Senator NEW. You spoke of him as an inspector a few moments ago?

Mr. LANG. He is H. K. F. Williams, I think.

Senator NEW. Where does he come from?

Mr. ARDIS. He is head of the Mahogany Bureau for the Signal Corps.

Senator NEW. Do you know what his business was before he came to Washington?

Mr. LANG. Yes, sir; he is an ex-partner of Ichabod T. Williams, of New York.

The CHAIRMAN. What was his business?

Mr. ARDIS. Hardwoods. They virtually control the Honduras mahogany.

Senator NEW. Do you know from what source the Signal Corps has accepted the lumber that it has approved for use in the making of propellers?

Mr. LANG. They have approved a number of woods. They have approved walnut, true Honduras mahogany, white oak, beech, poplar, oak, and cherry. They have suggested that we make propellers from time to time out of cherry, poplar, and beech. They said if your price is high you can reduce your price by using cheaper lumber. I do not consider it the right thing to use this lumber. Beech, poplar, and cherry are all three timbers which are grown in various different localities. Some grow on top of the hills, some in the valleys, and some on the side of the hills. They grow all over the whole country and you can buy them all over the country. You take a piece of wood from a tree grown in northern Maine and a similar one from a tree grown in the South. Simply because their names are cherry, chestnut or beech does not indicate that they are the same lumber.

Senator REED. The fibre is affected by climatic conditions and by altitudes?

Mr. LANG. Exactly and as to whether the ground is swampy. I will even say it is possible to determine quite easily with a magnifying glass which side of a tree a piece of lumber has been cut from, whether from the north or from the south side of a tree. The reason I have been fighting or contesting this mahogany use has been largely this: the mahogany tree is a very large tree. The density variation is very slight; that is to say, if you take the butt of the tree the density of the wood at the bottom near the ground is very much higher than the density is higher up. That is due to the way that the trees grow, of course. In the mahogany tree you will get 20 feet of clear run before the branches break out. That means this, that you can take a clean plank of lumber 20 feet long and the density variation per foot is very much less than if you have to spread that variation beyond 20 feet. The difficulty is in balancing your propeller, so you do not want great variation in the density of the material you are using. Also the mahogany tree is very large with a bell, 45, 50 or 60 inches, whereas you take the birch trees, and they are not very large. Cherry trees have many knots and limbs growing out on them and that is one of the reasons I have stuck to my guns in the mahogany situation.

The CHAIRMAN. What are your facilities for getting it?

Mr. LANG. I believe the facilities to-day for getting Honduras mahogany are limited.

The CHAIRMAN. I mean Tanguile mahogany.

Mr. LANG. I believe Tanguile mahogany is being piled up in the Philippines at about 100,000 feet a week.

The CHAIRMAN. What are your facilities for getting it from the Philippines to America?

Mr. LANG. Since this test has been made I think the Navy Department will now make it their business to see that this material is brought over from the Philippines.

The CHAIRMAN. They will bring it over if it is determined that it is the right wood to use for this purpose.

Mr. LANG. Yes.

Senator NEW. You say it is being piled up in the Philippines at the rate of 100,000 feet a week?

Mr. LANG. Yes, sir.

Senator NEW. That is not any too much.

Mr. LANG. That is being done with no market. It is simply to keep their mills running. They are prepared directly they get the word from the Navy Department they can develop it.

Senator REED. Do you understand that the man really in control here for the Government in the choice of materials to go into the propellers is the partner in a concern which controls Honduras mahogany?

Mr. LANG. Yes, sir.

Senator REED. And you have found some difficulty in convincing him that Tanguile mahogany might supersede the Honduras mahogany?

Mr. LANG. Yes, sir. I have never seen Mr. Williams personally on the subject because he has simply given me his edict when I came to see Lieut. Ryerson, or whoever it was. He would say, "There is what you can use. Take it or leave it."

Senator REED. Did he give you any answer?

Mr. LANG. The reason was that it was not satisfactory material. That is all I could ever get. All I got was verbally from Lieut. Ryerson.

Senator FRELINGHUYSEN. It is natural to assume it was Mr. Williams, is it not?

Mr. LANG. Yes, sir.

Senator REED. If at the present time the Honduras mahogany is commanding a very high price——

Mr. LANG. A very high price.

Senator REED. About how much is it bringing?

Mr. LANG. About 35 cents a foot super.

Senator REED. How thick?

Mr. LANG. One inch thick.

Senator REED. A square foot?

Mr. LANG. Yes, sir.

Senator REED. That is \$350 for a thousand feet.

Mr. LANG. Yes, sir.

Senator REED. What can Tanguile mahogany be procured for?

Mr. ARDIS. About \$250—that is, under the same classifications. The propeller classification is 8 inches and up in width and 1 inch thick and that same classification applies in propeller stock.

Senator FRELINGHUYSEN. What sizes do you have to use to veneer a propeller? What is the length, width, and thickness?

Mr. LANG. That varies from 8 inches in width and 6 feet in length up to 14 inches in width and 10 feet in length.

Senator FRELINGHUYSEN. How thick?

Mr. LANG. One inch at the least.

Senator REED. Don't you cut these pieces into thinner parts than an inch?

Mr. LANG. When I say an inch I should say that it comes slightly under an inch, but roughly speaking you can call it an inch.

Senator FRELINGHUYSEN. The edges are tapered off in the curve of the propeller. Can you procure any old woods from furniture, second hand, that you can use in making propellers?

Mr. LANG. It is extremely difficult.

Senator REED. How soon are you going to use steel?

Mr. ARDIS. That has been tried.

Senator REED. It has not worked?

Mr. ARDIS. It has not stood the test.

Senator FRELINGHUYSEN. Has maple ever been approved by the Signal Corps?

Mr. ARDIS. I am not sure. I have an idea it is not to-day on the list. The great difficulty being with these northern lumbers we have been talking about is that you can make propellers out of them; their strength is thoroughly satisfactory, but the tendency of the wood is very much to warp after the blade has been finished.

STATEMENT OF LIEUT. COL. T. H. BANE, SIGNAL CORPS.

Senator NEW. Col. Bane, you are an officer of the Signal Corps?

Col. BANE. Yes, sir.

Senator NEW. How long have you been connected with it, and by what avenue did you enter the Army?

Col. BANE. I graduated from West Point in 1907.

Senator NEW. In 1907?

Col. BANE. Yes, sir.

Senator NEW. And you have been in the Army ever since?

Col. BANE. I have.

Senator NEW. When did you become connected with the Signal Corps, or the aeronautical department?

Col. BANE. I went to San Diego in October, 1916, to learn to fly. I was detailed with the Signal Corps then.

Senator NEW. You are a practical flyer?

Col. BANE. Yes, sir.

Senator NEW. I would like you to give your opinion, in your own way, of some of the reasons for the present situation of our aircraft production.

Col. BANE. I believe the main and probably the most important reason is a lack of organization in the handling of such a big undertaking. Secondly, there is a lack of proper aeronautical engineering ability, or, at least, there is the fact that such aeronautical ability as exists has not been used to the best advantage. It is a question of automobile engineers assuming that they can manufacture airplanes without reference to men who are practical flyers and aeronautical engineers.

Senator NEW. Have we availed ourselves of such aeronautical engineering talent as we have in this country?

Col. BANE. I think not, sir.

Senator NEW. Would it not have been possible also for us to have availed ourselves of that kind of talent from our allies?

Col. BANE. Yes, sir. I am sure that we could have obtained aeronautical engineers had we asked for them from England, for example.

Senator NEW. But you think, as I understand you, then, that one of our mistakes has been that we have relied upon automobile engineers rather than upon aeronautical engineers?

Col. BANE. Yes, sir; automobile and other kindred trades. Mechanical engineers with no knowledge whatever of aircraft have been allowed to pass upon the same.

Senator NEW. If there are defects in our organization, will you state just what you think those defects are?

Col. BANE. Our present organization is as follows: Gen. Kenly is in charge of the department of military aeronautics, which has charge of all the training of aviators and the operation of aircraft. Mr. Ryan is charged with production. The original agreement left the engineering question in the air and made no one responsible.

The CHAIRMAN. You say the original agreement. What do you mean?

Col. BANE. I should have said the proclamation of the President. That leaves the question of engineering in the air. The production people feel that they should control entirely the engineering end of the game, and they have been doing so. There is no head or chief of the air service. A single head to the two divisions could quickly, by the use of common sense, settle many questions that now remain unsettled or must be carried to the Secretary of War. The result is that we get nowhere. We are unable to get anywhere. No one is running us. We feel that is vitally wrong and that there should be a common head to go to and force the other men to listen to reason.

Senator NEW. Who, in your opinion, should be responsible for the design of aircraft?

Col. BANE. The men who must fly the machines and use them, by all means. In my opinion the military use of aircraft is too closely related to the design of same to allow a commercial and nonmilitary organization to control the design, armament of aircraft, and equipment.

Senator NEW. As a matter of fact, by whom is the greater part of our designing being done now?

Col. BANE. By the Bureau of Production, sir.

Senator NEW. By the Bureau of Production?

Col. BANE. Yes, sir. It is under their control. Of course, we are practically doing nothing but copying designs. We have originated practically nothing.

Senator NEW. You say the Bureau of Production. Now, some one in the Bureau of Production does that for them.

Col. BANE. Yes, sir.

Senator NEW. Are the different plants and companies that are operating under the Bureau of Production allowed a great deal of latitude in that respect?

Col. BANE. I can only answer from my personal observation. I feel that they are given full latitude to make changes. As an instance I may cite the case of the Bristol fighter. It was turned over by what was then the aircraft engineering section of the Signal Corps, in charge of Lieut. Col. Clark. It was sent to the Curtiss Co. with a wing loading of 7.1 pounds per square foot. It now has a wing loading of 9.2 pounds per square foot. Col. Clark has never been consulted, nor has he ever seen the machine since, and has never been to the Curtiss Co. since the original drawings were sent there.

Senator REED. He is a practical flyer?

Col. BANE. He has not been flying recently. He has been in the designing game. He did fly up to the time he left McCook Field, about four months ago.

Senator NEW. You are speaking of Col. Clark?

Col. BANE. Yes, sir. He is a practical flyer.

Senator NEW. He designed the Bristol fighter for a wing load of 7.1 pounds per square foot, and that has been changed at the Curtiss works so that the wing loading is now 9.2; is that correct?

Col. BANE. The figures from which I determined that its present loading is 9.2 pounds were given me yesterday at the Curtiss plant. They indicated 9.2. I will say that the machine has been recently changed in many respects. The late weights were not available. They are being made to-day. We will have them to-morrow, I think.

Senator REED. The Bristol fighter has been the occasion of many fatal accidents, has it not?

Col. BANE. Yes, sir.

Senator REED. The wings, we are told, give out. In your opinion, has this load which was put upon the plane, this additional load, anything to do with that?

Col. BANE. Yes, sir. That is the cause for the present situation, I think. The difficulty has been that the fabric comes off. You can not point to the wing loading and say that that is entirely responsible, because there are other things to point out. For example, the fabric was not properly doped. We also thought that the rib spacing on the Bristol was too great. It has been changed now from 15 inches to 7½. Then there is the question of spacing of stitching.

That was 6 inches, and that has been lowered to 4 inches. Then they have added recently a cotton fabric weighing 8 ounces per square foot.

Senator REED. The extra heavy weight aggravated all the more the deficiencies in construction?

Col. BANE. Yes, sir.

Senator REED. And one of the principal causes of accidents is the extra heavy load?

Col. BANE. I think so; yes, sir.

Senator REED. That extra heavy load might perhaps be carried if there was better construction?

Col. BANE. It affects the maneuverability of the airplane. Planes are not ordinarily loaded as high as 9.2 per square foot, no matter how small. You do not load that heavily. With such a heavy loading there is a decided tendency to stall quickly, when the power fails and consequently to spin.

Senator REED. What you mean is this: There has been an overloading of the wings, and that overloading of the wings itself would constitute a great element of danger?

Col. BANE. Yes, sir.

Senator REED. And in addition to that you have had improper construction?

Col. BANE. Absolutely.

Senator REED. And even if the construction is of the best, you still think that the excessive load on the wings makes the plane a very dangerous thing?

Col. BANE. Yes, sir. I have figures on foreign planes and American planes. Running down the column, I see that none of them are loaded that heavily. I have before me a table of performances of service airplanes.

Senator NEW. I think we have that table.

Senator REED. What is the wing load?

Col. BANE. The wing load, taking the English Bristol fighter, is 6.5.

Senator REED. Give us the wing loads of the different machines.

Col. BANE. The Armstrong-Whitworth is 5.6. The BE 2-C is 5.8. The BE 2-D is 5.3. Suppose, Senator, I would just state they range from 5.6 to 8.4.

Senator REED. Without giving the names of the machines, can't you give the wing load of each of them?

Col. BANE. Yes. They are as follows: 5.6, 5.8, 5.3, 5.9, 5.7, 6.9, 6.5, 9.6; the figure 9.6 is a monoplane; 7.4, 7.4, 7.5, 8.4, 7.7, 7.6, 8, 8, 7.1, 7.7, 8.2, 7.5, 8.4, 8.2, 6.2, 7.5, 6, 7, 6.9, 7.6, 8, 7.9, 6.7, 6.2, 6.3, 6.4, 6.5, 7.3, 4.8, 5.2, 6.4, 6, 8.2, 7, 7.4, 7.6.

Senator NEW. So that it would appear from this table that no biplane carries a wing load of more than 8.4.

Col. BANE. Yes, sir.

Senator REED. Now, how does it happen that the monoplane can have a greater weight upon it and yet sustain it?

Col. BANE. The monoplane must necessarily have a load that is heavier, because it has only one surface.

Senator REED. A monoplane is of heavier construction than is employed in a biplane?

Col. BANE. Yes, sir.

Senator REED. So that the fact that the monoplane carries 9.6 pounds per square foot affords no reason why a similar weight could be carried by a biplane properly built?

Col. BANE. No, sir.

Senator NEW. Col. Bane, have you had occasion to make any recent investigation of the Bristol fighter?

Col. BANE. Yes, sir. I returned this morning from Buffalo, where Col. B. Q. Jones, Maj. H. S. Martin, and myself were called in a conference with Mr. Landon, of the Production Bureau, with regard to the Bristol fighter.

Senator NEW. What was the occasion for them calling you to Buffalo?

Col. BANE. There was recently an accident in which a man named Hale was killed and a pilot named Sharpe was severely injured, due to the wreck of a Bristol fighter at Buffalo.

Senator NEW. Hadn't there been a similar accident a short time ago, on the 10th of June, in which Pilot Rader and an observer lost their lives in a plane of the same type?

Col. BANE. Yes, sir. There were two previous accidents, one at the Wilbur Wright field, in which Pilot Doolittle was severely injured, due to the fabric coming off the left wing. The other accident was at Dayton, in which Rader and Connors were killed, due to the same defect—the fabric coming off the wing.

Senator NEW. What was the result of the investigation that you officers made yesterday of the Bristol?

Col. BANE. We decided to recommend that they stop production at once of the Bristol fighter, and that the disposition of the Bristol fighters now practically completed be taken up and settled at a conference at Washington on Thursday of this week between the Production Division and the department of military aeronautics.

Senator NEW. Can you tell us how many of those machines there are?

Col. BANE. We were told that 200 were practically completed and about 400 others were in various stages of completion.

Senator NEW. So that there are 600 of those machines that are now to be put into the discard?

Col. BANE. As far as the figures go, that is approximately correct. I do not know the exact figure, however.

Senator REED. Before we leave this question of the weight of the wings, I would like to ask something more about that. That Bristol fighter is really, in its general lines, a copy of the English Bristol fighter, is it not?

Col. BANE. There have been so many changes that I would hardly say it would be recognized as a copy of the English Bristol fighter.

Senator REED. They started with the English Bristol fighter?

Col. BANE. Yes, sir.

Senator REED. Who made those changes? Did the Production Department or the manufacturer or the flyer make them?

Col. BANE. The aviators have had nothing whatever to do with it.

Senator REED. Do you know whether the spread of the wing surface of the present American Bristol fighter is substantially the equivalent of the English Bristol fighter?

Col. BANE. Exactly the same.

Senator REED. Tell us the weight of the engine that was employed in the English Bristol fighter, or of the two engines, and also tell us what the character of the engine was.

Col. BANE. May I refer to my table?

Senator REED. Certainly. That is just exactly what we want.

Col. BANE. Seven hundred and ten pounds is the weight of the Rolls-Royce engine in the Bristol fighter.

Senator NEW. Seven hundred and ten pounds. The weight of the Liberty 12 is what?

Col. BANE. Eight hundred and twenty-five pounds.

Senator NEW. So that there is an increase of 115 pounds, at least in the matter of the engine?

Col. BANE. Yes, sir.

Senator REED. You have given the weight of the Rolls-Royce. What other engines were used in the Bristol fighter?

Col. BANE. The 200 Hispano-Suiza.

Senator NEW. What was the weight of that?

Col. BANE. Five hundred and fifteen pounds for the 200 horsepower Hispano-Suiza engine.

Senator REED. What other type of engine was used in the Bristol fighter?

Col. BANE. There are several others. I can not tell you offhand.

Senator REED. All those machines that they have had accidents in that you have referred to have been equipped with the Liberty motors?

Col. BANE. Yes, sir; all of them. I have not the figures showing what other engines have been used in the Bristol fighter.

Senator REED. But the ones generally used have been the Rolls-Royce and the Hispano-Suiza; is that correct?

Col. BANE. Yes, sir.

Senator REED. The difference in the weight of the engines you have given accounts in part for the difference in the load, but what else have they done to increase the load of the Bristol fighter besides putting in a Liberty 12 engine?

Col. BANE. The Bristol machine, as originally released to the Curtiss Co. by Col. Clark, had a calculated weight of 2,937 pounds. This included the following equipment: Liberty engine, two men, fuel, oil, water, one Martin gun, 800 rounds, one Lewis gun, scarf mount, 970 rounds. The machine as produced by the Curtiss Co. with the above equipment, weighed 3,146 pounds. The Bristol has since had the following equipment added: One extra Marlin gun, 23.5 pounds; 200 additional rounds, 13.5 pounds; one extra Lewis gun, 17 pounds; additional weight of mounting of two guns and changes in construction, 15 pounds; camera, L type, 10-inch focus, 2 extra magazine plates, etc., 54 pounds; radio apparatus, 82 pounds; bombing outfit, 283 pounds; flares for night lighting, 6 pounds; pistols and cartridges, 6 pounds; oxygen tanks, two, 25 pounds; making a total additional weight over the original design of 525 pounds. This resulted in a total weight of 3,671 pounds. However, in the process of construction of the machine it has been decided to leave off the bombing equipment, weighing 283 pounds, but the machine still weighs approximately 3,700 pounds. I have not the exact weight. They gave me two figures, but it is close to 3,700 pounds.

Senator REED. Before your testimony is printed you will perhaps get the exact weight.

Col. BANE. I will change that to say that the machine now weighs 3,662 pounds. That is the figure they gave me. I am certain that is correct.

Senator REED. You said that when Col. Clark released the machine with the Liberty motor it weighed 2,937 pounds.

Col. BANE. On paper—engineer's calculation.

Senator REED. But the Liberty motor itself was an increase in weight over the English motor that had been previously employed in this character of machine.

Col. BANE. Yes, sir.

Senator REED. So that even as originally released there was an increase of something like 115 pounds over the Rolls-Royce engine, and something like 400 pounds over the machine when equipped with the Hispano-Suiza engine.

Col. BANE. That is approximately correct.

Senator REED. The Hispano-Suiza engine was being manufactured in this country before this, was it not?

Col. BANE. Yes, sir.

Senator REED. And has been manufactured since?

Col. BANE. The 150 and the 180; yes, sir.

Senator REED. And yet they never secured that engine for use in this Bristol fighter?

Col. BANE. No, sir; no attempt has been made to secure it.

Senator REED. And yet that is an engine that would weigh nearly 400 pounds less than the Liberty engine.

Col. BANE. It was thought it would not develop enough horsepower.

Senator REED. But they are making a larger one that weighs considerably less than the Liberty and does develop sufficient horsepower?

Col. BANE. The 300-horsepower Hispano-Suiza; yes; but that is still in an experimental state.

Senator REED. You said that it was thought it did not have power enough, but the British were using it right along, were they not?

Col. BANE. Yes, sir; but they wanted more power; they preferred more power. It was also thought that the British would put some more powerful engine into it before we could get it into production. The Liberty was the only powerful engine then available, so it was used.

Senator REED. Would a skilled aeronautical engineer have weighted this Bristol fighter with its present construction as it has been weighted?

Col. BANE. No, sir; certainly not.

Senator REED. Would a skilled aeronautical engineer have permitted the character of construction which is now being employed on the Bristol fighter?

Col. BANE. No, sir; he would not have.

The CHAIRMAN. What particular individual made these changes which resulted in such an increase of weight?

Col. BANE. I understand that Col. E. J. Hall and Mr. Mueller, of the Curtiss Aircraft Corporation, made these changes. I know that no reference was ever made to the original designers, Col. Clark and his force, at McCook field.

Senator REED. Is Col. Hall a flyer?

Col. BANE. He is not.

Senator REED. Is he an aeronautical engineer?

Col. BANE. He is not.

Senator REED. Is he an automobile engineer?

Col. BANE. A manufacturer of aeronautical motors, of the Hall-Scott Co.

Senator REED. What about Mr. Mueller; is he a flyer?

Col. BANE. No, sir.

Senator REED. An aeronautical engineer?

Col. BANE. No, sir.

Senator REED. What was his occupation?

Col. BANE. He is a mechanical engineer, sir, and a very successful one, I understand. I do not know exactly what line.

The CHAIRMAN. Is he the general manager of the Curtiss Co.?

Col. BANE. I think not.

Senator NEW. He is the chief engineer of the Curtiss Co.

The CHAIRMAN. That is what I meant to say.

Senator REED. If I understand you correctly, all of these machines which have been completed will probably be condemned. Would it not be possible to use those machines for flying with safety if they took away from them all of this military load that has been added to them?

Col. BANE. That is a question that is going to be decided to-morrow, whether we can take that machine and strip it and use it for some one purpose.

Senator REED. For training, for instance?

Col. BANE. Training; for instance.

Senator REED. We have got plenty of training planes, have we not?

Col. BANE. But we require the service type of machine.

The CHAIRMAN. Would it be possible to strip the machines of the added weight, the weight which has been superimposed by Mr. Hall and Mr. Mueller, and then use them with the Hispano-Suiza engines?

Col. BANE. That question will be taken up. The Hispano-Suiza engine is now being tested in the English-built Bristol fighter.

The CHAIRMAN. What type?

Col. BANE. The 300-horsepower Hispano-Suiza. Of course, the machine built for the Liberty engine has been changed so that it is not the English machine any longer.

Senator REED. I want now, if you please, to ask a little more in detail about the parts and the construction of the wings which you spoke about some time ago. You said something about the stays being far apart, I believe.

Col. BANE. The ribs.

Senator REED. Those ribs are very light, are they not?

Col. BANE. Yes, sir; they are very light. They are thin wood with lighting holes in them.

Senator REED. Was the defect you have referred to one which an aeronautical engineer would have readily discovered and known?

Col. BANE. Well——

Senator REED. I will put the question in a different way. Would a skilled aeronautical engineer have built these planes with the ribs 15 inches about?

Col. BANE. I think not, sir. That is a question, I guess, about which the engineers might differ. It is a question, however, of load to be carried.

Senator REED. Would he have done it when he knew he was going to put the load on that has been put on this machine?

Col. BANE. No, sir.

The CHAIRMAN. Isn't that entirely an impracticable load for a machine of that type?

Col. BANE. Yes, sir; it is absolutely so, sir.

Senator NEW. What about the Liberty motor for the Bristol plane? Is it adapted to it, in your judgment? Is the Liberty 12 engine adapted for use in the Bristol plane?

Col. BANE. Whenever you change the engine for which the plane was built you practically have to redesign the entire plane. It is possible that you could make a machine along the lines or similar to the English Bristol with the Liberty 12, but to take the English Bristol and merely make some slight modifications so as to put the Liberty 12 in is not right and it should not be done. It is a patched up and botched-up job and could not be made successful, in my opinion. One more difficulty is that the Liberty cylinders are placed at 45°. They are very high and you can not see out over the machine. Your visibility is ruined in the Bristol fighter due to the shape of the engine.

Senator NEW. I would take up the subject of the De Haviland 4.

The CHAIRMAN. I would like, Senator New, before you do that, to ask one or two questions with regard to the accident.

Senator NEW. All right.

The CHAIRMAN. Col. Bane, what, in your judgment, was the cause of the accident to the Bristol plane last Monday?

Col. BANE. The fact that it was too heavily loaded. When the engine stopped the pilot attempted to turn to get back into the field. Due to its heavy loading, it almost immediately stalled and went into a spin. Of course, the pilot turned too flat; he should have banked up steeply and nosed the machine downward. Or better still, he should have landed straight away. The plane did not have the gliding capacity that a light machine would have.

The CHAIRMAN. Was this a private test?

Col. BANE. I can not say. I think it was merely a flight to test some equipment on the plane.

The CHAIRMAN. Was the pilot a Government pilot?

Col. BANE. I do not know that.

Senator REED. What made the engine stop; does anybody know?

Col. BANE. They were not able to determine. They think perhaps the gravity tank, which contains but a few gallons of gas, was used to get off the field, and that the pressure tank was not put in. He may have run out of gasoline. The thing was so thoroughly wrecked that they were really not able to determine the cause.

Senator REED. But the engine stopped?

Col. BANE. It did stop. The cocks were closed on the main tank. It is possible that he closed them. All pilots are afraid of fire, and when they know they must make a forced landing they shut off the main gasoline tank. The pilot himself was not killed.

Senator NEW. We are also making in this country the De Haviland 4, are we not?

Col. BANE. Yes, sir.

Senator NEW. What was the De Haviland 4 originally?

Col. BANE. It is a day bomber and a long-distance reconnaissance machine.

Senator NEW. A British machine?

Col. BANE. Yes, sir; equipped with the Rolls-Royce engine.

Senator NEW. We have undertaken to make them in this country?

Col. BANE. Yes, sir.

Senator NEW. Do they make it exactly like the British model, or have we made changes in the model?

Col. BANE. Very few, and only minor changes. The machine is almost an identical copy of the British DH-4.

Senator NEW. Is the DH-4, in your estimation, an entirely satisfactory airplane?

Col. BANE. No, sir; it is not. The performance of the DH-4 is not as high or as good as the performance of the British DH-4.

Senator NEW. What is the reason for that?

Col. BANE. It may be the motor; it may be the propeller. It certainly is, to a great extent, the radiator.

The CHAIRMAN. Do you think the position of the carburetor on the machine has anything to do with it?

Col. BANE. Yes, sir. The tests made by Capt. Lepere indicate that you can get more horsepower with the Liberty by taking the carburetor out of the V and putting it down.

Senator REED. Putting it down where?

Col. BANE. Taking it out of the V. You can put two on each side, or put them on the end.

Senator REED. Why does that mere shifting make this difference?

Col. BANE. The cylinders are set on an angle of 45°. This is a big duplex, zenith carburetor, and it takes up the entire space in that V, making a poor manifold, full of angles, and the gas passages in the cylinders are very bad, as a result. If you have a straight passage it is better. By putting the carburetor in the rear, you have a long, straight passage without a lot of angles, and it is much more satisfactory. They will come to that later on.

Senator NEW. You said, I believe, that you thought one reason why the American-built De Haviland 4 was less satisfactory than the British machine of the same type was owing to a change in the motor.

Col. BANE. Yes, sir. We use a different motor.

Senator NEW. What motor is used in that machine by the British?

Col. BANE. The Rolls-Royce 360-horsepower.

Senator NEW. And what motor by the United States?

Col. BANE. The Liberty 12.

The CHAIRMAN. Is the Rolls 360 a 12-cylinder machine?

Col. BANE. Yes, sir.

The CHAIRMAN. Then you think the Rolls-Royce is better adapted to a plane of that design than the Liberty motor; is that correct?

Col. BANE. I would like to put it differently.

The CHAIRMAN. Whichever way you please. What we want to get is your explanation of the matter.

Col. BANE. The Rolls-Royce is rated at 360, and it turns up always 360. The Liberty, on the other hand, is rated at various horsepowers, from 400 to 452. I have before me the fifty-sixth report of the comptroller of the technical department of England, in which they have a test of the Liberty 12.

The CHAIRMAN. Is this a British report?

Col. BANE. Yes. They say the power of the Liberty 12, full power is 375, at 1,657 revolutions per minute. At nine-tenths full power, which is normal, it is 350, at 1,610 revolutions per minute. In other words, I feel that the Liberty does not constantly turn up as

high a horsepower as the Rolls-Royce. I believe that this can be and will be corrected. There are a great many things that are being worked upon. The radiation, for instance, is not satisfactory, and the intake manifold, already mentioned, is not satisfactory. The intake passages into the cylinder from the manifold to the valve proper are full of angles and pockets that are now being worked upon. All these points will increase the efficiency of the Liberty motor so that at a later date it will probably be a more powerful engine.

Senator NEW. But as matters stand to-day, is it less satisfactory than the Rolls-Royce.

Col. BANE. Yes, sir. That, of course, is my own opinion.

Senator NEW. You say that the DH-4 is not an entirely satisfactory airplane. You have also said, I believe, that its primary purpose was for use as a day bomber.

Col. BANE. A day bomber and a long-distance reconnoissance machine.

Senator NEW. And a long-distance reconnoissance machine. What radius of operation has the DH-4?

Col. BANE. I have a recent test which was made at the Wilbur Wright Field. The radius at full throttle was given as 1 hour and 53 minutes.

The CHAIRMAN. Was that test made last May?

Col. BANE. The latter part of May or the first of June.

The CHAIRMAN. That is very low, is it not?

Col. BANE. That is very low.

Senator NEW. I want to digress just one moment to bring out one point. What is the gasoline capacity of the DH-4 as made in this country? Is it the same at all places of manufacture?

Col. BANE. It is not. At the Dayton-Wright plant, as it is being produced, it now has a capacity of 66 gallons. At the Fisher Body Corporation, it has a capacity of 88 gallons.

Senator NEW. You mean the carrying capacity?

Col. BANE. The tanks hold that much.

Senator NEW. One holds 66 gallons of gasoline and the other 88 gallons of gasoline; is that correct?

Col. BANE. Yes, sir.

Senator NEW. Is there any reason for that; and if so, what is it?

Col. BANE. The Dayton-Wright plant got into production first on DH-4 machines with the 66-gallon tank. By this time it had been determined that the Liberty motor consumed at full throttle approximately 36 gallons of gas per hour, so that the Fisher Body people saw the necessity, as everyone saw it, of increasing, if possible, the gasoline capacity, so they built and put in a tank holding 88 gallons. That is, the combined capacity of the two tanks is 88 gallons.

The CHAIRMAN. With that consumption it would be impossible, whatever the endurance of the engine might be, to run two hours with only 66 gallons of gas and a consumption of 36 gallons per hour.

Col. BANE. Yes, sir.

Senator NEW. I desire now to ask a question which refers to the military aspect of this matter. What disadvantage would it be to the commander of a squadron to have his planes carrying different loads of gasoline? In other words, would it place him at a disadvantage if he had a squadron of airplanes turned over to him with which to make a raid and part of them carried 66 gallons of gasoline while the rest carried 88 gallons of gasoline?

Col. BANE. Yes, sir. He would be in the position of a cavalry commander with lame horses. He would have to take the gait of the poorer horses. In other words, he can only go as far as the small capacity will carry him.

The CHAIRMAN. It is something like a convoy with a fleet of transports, where there is a difference in capacity of knots per hour.

Col. BANE. Yes, sir.

Senator NEW. With the 66 gallons of gasoline, a De Haviland plane has a capacity of 1 hour and 40 minutes in the air.

Col. BANE. That is approximately correct.

Senator NEW. And all the machines that are made at the Dayton-Wright factory carry the 66-gallon tanks? Is that true?

Col. BANE. I have that data from Mr. McClellan, dated July 3. All tanks will be provided with electrically driven tanks and they will be bullet proof tanks at a later date.

The CHAIRMAN. No change in the capacity?

Col. BANE. I do not understand they will change the capacity, but they will have an electrical feed instead of the pressure feed. That is all the data I have.

The CHAIRMAN. Would the electrical feed be substituted for the pressure feed, or do they co-exist?

Col. BANE. No, sir; there would be a substitution. The pressure feed is unsatisfactory on account of the fire danger.

The CHAIRMAN. In your judgment, can the consumption of gas per hour be reduced without impairing the efficiency of the plane?

Col. BANE. That is hard to tell. I am not enough of an engine expert to know. I should think that is pretty high.

In this connection I would like to state that this condition should not hold. If the Fisher Body Corporation can get 88 gallon tanks in the machine they can do it at the Dayton-Wright Co. The reason it is not done is that the production people want to ship the planes overseas.

The CHAIRMAN. I suppose that is due to the public clamor for shipments.

Col. BANE. It is too bad they are not shipped standard—that is, all alike.

Senator NEW. Is the DeHaviland 4 suitable for use as an observation plane?

Col. BANE. Yes, sir; it can be used. In fact, that is about the only use to which it can be put due to its limitations as to radius. It can be throttled down and used satisfactorily as an observation plane.

Senator NEW. As a matter of fact, you state that that is about the only use to which it can be put to best advantage?

Col. BANE. Yes, sir. Of course it can be used for short distance reconnaissance and photographic work, but it can not go long distances. It can not do much bombing work.

Senator NEW. The radius is limited to that of an observation plane.

Col. BANE. Yes, sir.

Senator NEW. What steps are being taken, if any, to manufacture fighting planes of other designs? Of course, I have no reference to training planes.

Col. BANE. We have the English Bristol with the 300 Hispano-Suiza. We are now experimenting with it. Capt. Le Pere has turned out a large machine with the Liberty 12, which has been tested, but

it is not entirely satisfactory, due to propeller and radiator difficulty. He is now experimenting with a second machine on which I have no report. Then we have the Caproni and the Handley Page, and we have the USD-9, which is a copy of the DH9, which is almost the same as the DH-4, with 50 square feet of additional wing spread. Three of these are being built at McCook Field and will be turned over to the Department of Military Aeronautics for test very shortly.

Senator REED. That is, single machines are being built experimentally?

Col. BANE. That is all; yes, sir.

Senator NEW. Nothing is yet known as to whether the designs will be approved or not?

Col. BANE. No.

The CHAIRMAN. What about the SE-5?

Col. BANE. That is going into production. I believe they have the drawings completed and will start shortly. It is a single seater machine.

Senator NEW. What are the prospects for improvement in the general situation with reference to aircraft production, if there are any prospects?

Col. BANE. We feel that there are not many prospects. The whole situation is very discouraging. We feel that if the bureau of production would confine themselves entirely to producing something that the military people approve of and want, a great deal more progress could be made. A great deal of time is now being devoted to testing freak models of airplanes and producing such machines, without consulting people who could almost at a glance state that such a machine has no part in the military program.

The CHAIRMAN. Don't you think it is a good idea to test new types of machines?

Col. BANE. Yes, sir; on paper. You can eliminate two-thirds of them on paper by standards that everyone knows about, except the production division.

The CHAIRMAN. You mean it is known by men of experience in aeronautics?

Col. BANE. Yes, sir. I have in my office men every day with models. After a great deal of persuasion I am able to convince most of them that they have no military value. There is nothing mysterious about the construction of aircraft. It is perfectly standard. It is not at all mysterious. The British are probably head and shoulders ahead of the rest of the world, and we could not go far wrong in following in their footsteps in view of the fact that we are so young at this game.

Senator NEW. Having asked you a previous question and having elicited the answer which you gave, I will ask you what, in your judgment, ought to be done here to improve this situation?

Col. BANE. I believe that there should be one head of the Air Service. I believe that the engineering features—the organization—should include in its personnel military aviators with a knowledge of the use of military aircraft so as to, if possible, avoid some of the glaring mistakes that have been made in the past. In this connection I would like to add that I believe it would not do any good to turn over to the bureau of aircraft production military aviators with a knowledge of aero dynamics for the reason that they have had in the past such men and they failed to use them or to take their advice.

I believe that the engineering problem could be controlled by the man who controls the operation of aircraft.

The CHAIRMAN. Why could not an engineering organization be made to bridge over any difference between the present dual organization? In other words, why couldn't the engineers consist, as you say, of men in and out of the military service, without having full control over the type for production?

Col. BANE. If you can get an organization that would not be under the control of production, I should think it would be satisfactory.

The CHAIRMAN. Say, for instance, under the joint control of Ryan and Kenly.

Col. BANE. I do not believe that a man can have two masters and satisfy both of them.

The CHAIRMAN. That is absolutely 'axiomatic if the two masters are pulling in different directions, but if the men could act as partners—and they should be partners in a matter of this sort—why couldn't some such arrangement be made?

Col. BANE. I think that basically such a thing is impossible for the reason that the man who wants to use the plane and wants to make a modification——

The CHAIRMAN. What such a man says ought to go.

Col. BANE. That is the reason I say he should control the matter.

The CHAIRMAN. You may be right. I wanted to get your view of the situation.

Senator NEW. You spoke a while ago of our following the British system. I would like to ask you with reference to the British system for directing changes in their machines as the occasion for changes manifests itself.

Col. BANE. The British have the following system: They have what they call three classes of changes. A class 1 change means that all people operating that plane or manufacturing that plane will immediately incorporate the change in the plane before it goes again into the air. In other words, it is a vital change that affects the safety of the machine, we will say.

Senator NEW. And the safety of the man in it?

Col. BANE. And the safety of the man in it; yes, sir. That is class 1. A class 2 change is a change that is made, or should be made, in the field, or at the different stations, as soon as possible, but it is not vitally important. A class 3 change is a change that will be put into future production. It need not be incorporated into machines already in service.

The CHAIRMAN. They act in future.

Col. BANE. Yes, sir. This system is used by the British very satisfactorily, and in this way the entire service is kept informed as to the status of the machines. When a machine fails, they know whether it fails as a result of some defect that is being corrected, or not. In this country we have no such arrangement. I wrote a memorandum to the Production Division telling of this British system. I received in reply a statement to the effect that it was very interesting.

The CHAIRMAN. When was that?

Col. BANE. That was during the month of June.

The CHAIRMAN. What particular individual replied?

Col. BANE. The memorandum was answered by Mr. Kellogg. That did not help me a great deal. The fact that it is interesting

does not help. Those things should be done; they are vitally important. The British have found it necessary. We are constantly placed in this position: A plane is flown at Mineola. The crank shaft breaks. We do not know if it is a new one or old one. I have never been informed what numbered motor this crank shaft was in. I write a memorandum to Mr. Potter. He does not know. He writes to the factory to find out. In 10 days, possibly, we find out that this was one of the old crank shafts.

The CHAIRMAN. Couldn't you find out directly from the commander of the Mineola field?

Col. BANE. The commander at the field would only know by taking measurements. The commander of the field does not know the dimensions of the interior parts of the motor. The only way he could find out would be to measure and compare with the drawings.

The CHAIRMAN. The machines are numbered?

Col. BANE. Yes, sir; that would be a direct check. If we knew in which serial number this change was incorporated we would know if there was an old crank shaft in the motor or a new one.

The CHAIRMAN. And if the old crank shaft would break, naturally it should not be used at all.

Col. BANE. That would be our idea, but that would stop production.

The CHAIRMAN. When you consider that lives are lost as a result, that should be the ruling consideration.

Col. BANE. I could give you another sample. The British people found out that it was necessary to put a stream line steel tube from the leading edge or main spar or front spar of the stabilizer to the lower longerons.

Senator NEW. In what machine?

Col. BANE. The DH-4. Away back last May I asked Col. Vincent, at McCook Field, why they did not incorporate such a change in this machine. In my opinion, the tail was not safe, and the British had found it so. He said he was then arranging to have it done. That was May 5. Col. Sempille arrived recently from overseas with drawings showing this change. I have asked recently that these machines be held up, stating that I considered this of vital importance. They assured me that the change has not been made yet, but they are trying to obtain the steel tubing in order to ship it overseas and have it put in over there. They do not want to hold up production for anything.

Senator NEW. I was about to ask you, Colonel, one final question, and that was if you think that steps are being taken to correct the deficiencies in the DH-4 machine? Your last answer, however, seems to indicate that you do not think so.

Col. BANE. I think they have these things in mind. They are working on them slowly and perhaps eventually they will be corrected. They are not getting out their drawings and they are not notifying us when they make the changes.

The CHAIRMAN. Is not the separation of the aviation from the Signal Corps, and the establishment of a separate military bureau a very desirable and beneficial change?

Col. BANE. It should be so, sir; theoretically. The air service having grown to such an extent at the present time, I should say that it would be very desirable. At present, however, I think we are worse off than we were six months ago.

The CHAIRMAN. You mean the military service?

Col. BANE. Not so much the military service.

The CHAIRMAN. I am talking about the production side.

Col. BANE. We have our difficulties, also. We are not exactly on Easy Street. We have our faults as well as the bureau of production.

The CHAIRMAN. Perhaps I did not make myself clear. The matter of aviation in the Army was identified with the Signal Corps. It was all under one head. Now, under the President's order appointing Gen. Kenly, aviation has been separated entirely from the Signal Corps.

Col. BANE. That is a great advantage; yes, sir.

The CHAIRMAN. Of course, that does not solve the problem.

Col. BANE. No, sir.

Senator NEW. I think that is all, Col. Bane. We thank you very much for coming.

STATEMENT OF MAJ. B. Q. JONES.

Senator NEW. Maj. Jones, you are connected with the Signal Corps and the aviation department, I believe.

Maj. JONES. Yes, sir.

Senator NEW. In what capacity?

Maj. JONES. At the present time I am assigned to the department of military aeronautics.

Senator NEW. You are assigned to the department of military aeronautics?

Maj. JONES. Yes, sir; and am awaiting transfer from the Production Division.

Senator NEW. Are you a graduate of the Military Academy?

Maj. JONES. Yes, sir.

Senator NEW. What year?

Maj. JONES. 1912.

Senator NEW. How long have you been connected with the Aviation Department?

Maj. JONES. Since December, 1913.

Senator NEW. Are you a practical flyer?

Maj. JONES. Yes, sir.

Senator NEW. What experience have you had as a flyer in the service of the Army?

Maj. JONES. I have been flying since the end of 1913 almost continuously, except for the winter of 1915-16, when I took a course in aeronautical engineering at Boston Tech.

Senator NEW. What has been your association with the Production Division lately?

Maj. JONES. I was loaned over there temporarily with the idea that I would be used in the airplane production engineering department, but they did not use me, so I asked Gen. Kenly to take me back, which he has. I am now awaiting transfer.

Senator REED. Where were you loaned?

Maj. JONES. To the Production Division.

Senator REED. Where did they keep you.

Maj. JONES. They had me in the production engineering department.

Senator REED. But where?

Maj. JONES. In the office here in Washington.

Senator REED. You were not out with the manufacturers here.

Maj. JONES. No, sir.

Senator NEW. What types of planes have we for training purposes?

Maj. JONES. The JN4D, which is a preliminary training plane; the JN4H, which is the same machine with a 150 Hispano-Suiza motor. It is being used because it has more horsepower and can thereby carry more of a load, which is necessary for training. It is simply a makeshift until we can get service types to finish up training. We also have the Thomas-Morse, which is a machine to be used for training in pursuit work. It was also a machine that was adopted and put into production against the recommendations of the flyers. The Bristol scout, which I flew when I was in Europe, is certainly a much better machine. This, I believe, was recommended as the single-seater pursuit machine for training, but was not put into production. We also have the Standard J-1, of which 1,600 were ordered against the recommendations of the flyers, and I believe just lately these have been ordered not flown.

Until quite recently I was chief of training, but upon my return from abroad I was relieved, so I do not know so much about the matter. I am not strictly up to date on training matters, in other words.

Senator NEW. You say these machines were ordered against the advice of the flyers?

Maj. JONES. Yes, sir; both the Thomas-Morse and the Standard J-1.

Senator REED. What flyers do you mean?

Maj. JONES. I mean flyers associated with what was then known as the Equipment Division.

Senator REED. Who are they?

Maj. JONES. Maj. Martin I know was one of them. He was most intimately associated with that division. Col. Clark was also one of them. He was more or less in and out of town. He was sent abroad to pick types.

The CHAIRMAN. What types did the flyers recommend?

Maj. JONES. We wanted the JN4D, and the Bristol scout, which is a copy of one of the best little scout machines that has been developed abroad for the 80-horsepower LeRhône motor or the 100-horsepower Gnome.

Senator NEW. Why were so many types of planes built?

Maj. JONES. The excuse given for the Standard J-1 was that they could not get enough Curtiss motors, as I remember it now. Therefore they had to use the Hall-Scott.

Senator NEW. And the Hall-Scott was adopted?

Maj. JONES. It has never been a satisfactory motor. I had considerable experience with it at San Diego, Cal., when I had charge of the aero repair shop out there. At that time I was not connected with the Washington office, so my personal recommendations were not asked for. Because there was so much trouble getting satisfactory Thomas-Morse machines, the Standard Co. had developed what they called, for a trade name, the M Defense machine, which I flew. It was very satisfactory. In order to get something for training, I recommended that they put them into production. The trouble with the Thomas-Morse machines was in diving. The whole

tail would vibrate very badly, making it very dangerous to fly. There was considerable trouble in eliminating that vibration. We had trouble with that machine right along, as can be expected from any new machine. I had gotten disgusted with it and wanted them to put into production something that we could get and that would be as satisfactory as could be expected. The whole thing would have been settled had they put into production the Bristol scout brought over here for that purpose, which I flew when I was abroad in order to verify reports I had heard of it. It is a very nice, strong machine.

Senator NEW. What types are they using for training purposes?

Maj. JONES. The JN4D and JN4H. They are building the Thomas-Morse. I know some of the M Defense machines are being built, but there is quite a wrangle on now about those machines.

The CHAIRMAN. Which machine?

Maj. JONES. The M Defense machine.

The CHAIRMAN. That is the machine that is being constructed at Plainfield, N. J.?

Maj. JONES. Yes, sir.

Senator REED. What is the De Haviland 4 used for?

Maj. JONES. It is primarily used for long-distance day bombing work. It is being abandoned, however, for the De Haviland 9. The reason is to get the pilot and the passenger together for communication in the air.

Senator REED. Is that a pretty good machine?

Maj. JONES. The De Haviland is really a marvelous machine as designed by the British. At first the De Haviland was flown with a motor rated at about 220 horsepower. It permitted of a tremendous range in new power plants. They are now using the Eagle rolls, which is rated at 375, without affecting any material change in the design. It is quite a feat to be able to shift power plants.

Senator NEW. You mean to use different motors?

Maj. JONES. Yes. They have shifted up and up without interfering with production.

Senator NEW. Who determines the types of planes that are to be built?

Maj. JONES. Until recently the Production Division not only determined that, but determined how they were to be built, where they were to be built, in what quantities they were to be built, and, from my experience in training, they also determined where they would be sent, because ever since last December I tried to get a service type machine for training, guns, and ammunition, but was unable to get them. Although we wanted them very much, we were unable to get them because they were shipped overseas. They seemed to be more anxious to ship the stuff overseas than they were to have training satisfactorily carried on in this country. Last March a statement came out in the newspapers to the effect that they were shipping machines overseas faster than they were able to train the personnel. Of course, they were, because we could not get the equipment with which to train the personnel.

Senator NEW. What is the present working arrangement between the Production Division and the Division of Military Aeronautics?

Maj. JONES. I can tell you what the working arrangement is supposed to be, but what it actually is, is another matter entirely. Due to a hundred and one different matters, it does not work out.

The Division of Military Aeronautics, upon conference with the Production Division, determines what machines shall be put into production. The Bureau of Production builds the machines. The Bureau of Production informs the Department of Military Aeronautics of any strength tests, or other tests, in which the Department of Military Aeronautics would be interested, and the Department of Military Aeronautics has representatives present. After the planes are completed they are supposed to be presented to the Department of Military Aeronautics, which decides whether they shall be accepted and turned out for operation by the service. No mention is really made as to who shall decide technically on engineering matters. The inference that I gather is that production shall be responsible for such matters. On the other hand, it turns around, and one infers that in order for the Department of Military Aeronautics to pass on these things they must have a trained technical staff. I think that technical and engineering matters were not left out purposely, but were left out because whoever drew up the agreement did not realize the importance of it, or it never occurred to them.

The CHAIRMAN. Do you mean the order of the President?

Maj. JONES. No, sir. It is a joint agreement between Gen. Kenly and Mr. Ryan, approved by the Chief of Staff.

Senator NEW. How do you think that agreement really works?

Maj. JONES. Well, it does not work. It never will work as long as a production man who knows nothing of either the active service end or the real airplane engineering is allowed to control. It is impossible for a man, whose whole record of success depends entirely upon statistics of production, to pay much attention to other features, especially if it is a matter with which he is unfamiliar.

Senator REED. Pay much attention to what other feature?

Maj. JONES. To the service end.

Senator NEW. What is the trouble in production now, and what is the remedy for it, in your judgment?

Maj. JONES. The trouble, as I see it, in production, starts with entire ignorance—not entire ignorance, but almost entire ignorance—with regard to proper aviation and engineering, and a lack of adequate personnel throughout the Production Department, starting right from the Production Division itself and extending out through all the factories. There is a lack of proper organization. The remedy for it, as I see it, is to give to the so-called youngster aviators some responsibility. It is because they are youngsters that they will not give it to them. They simply have no power. They do not pay attention to the young aviators. Give them responsibility, or at least recognize, or attempt to recognize, the aviation end and the engineering end. Then develop an organization and be willing to let the organization function. It is removing from the central heads the control of a lot of matter which, in a proper organization, should never have passed through their hands.

Senator REED. Let me put that in different language. You mean, in other words, to put some competent men in charge of production, or some people who know something about flying and something about aviation engineering?

Maj. JONES. Yes, sir..

Senator REED. And not leave it to a lot of people who know nothing about it, except as they have picked it up from books or from a study on the ground.

Maj. JONES. That is it.

Senator REED. You think that some men who has been in the air ought to have something to say about the machines that are going into the air?

Maj. JONES. Yes, sir.

Senator NEW. Is there any parallel organization that our service might follow?

Maj. JONES. Yes, sir; the British.

Senator NEW. Describe that to us. Tell us how it works.

Maj. JONES. Briefly, the whole technical or engineering end is actually controlled by the service people, and the production people build what they are told to build. That is what it is, briefly. You can get an idea of the whole organization and the whole system of working in detail of the royal air force from the board, consisting of Gen. Brancker, Col. Sempille, and Sir Henry Fowler, that was sent over here on this one matter, I believe.

Senator REED. Are they flyers?

Maj. JONES. Gen. Brancker and Col. Sempille are flyers. They are flying all the time.

The CHAIRMAN. They came over at different times, did they not?

Maj. JONES. No, sir. They came over at the same time. They came over particularly on this job, I believe.

The CHAIRMAN. That was recently?

Maj. JONES. Yes, sir. They landed here the 12th of June.

The CHAIRMAN. I would now like to ask something about the accident to the Bristol fighter last Monday. You went up there didn't you?

Maj. JONES. Yes, sir.

The CHAIRMAN. What, in your judgment, was the primary cause of that accident, or what were the causes?

Maj. JONES. The primary cause was that the machine requires more than average ability to fly it. The secondary cause was the pilot was a flyer who did not have this ability.

The CHAIRMAN. Was the machine, in your judgment, overloaded?

Maj. JONES. Any machine that is loaded beyond 9.1, as that was, is an overloaded machine.

Senator REED. You say "beyond" that. Do you mean beyond that or loaded to that?

Maj. JONES. Loaded to that. With such heavy loading you get into the scout class, i. e., machines designed especially for speed. To get speed you must have small wing surfaces, which gives heavy loading. That means that it will land fast and is tricky. I know of no machine other than the Moranne parasol or the Bristol monoplane that will load above that.

The CHAIRMAN. Do I understand you to say the smaller the machine the heavier the load?

Maj. JONES. Not necessarily. It depends upon the purpose for which the machine is designed.

The CHAIRMAN. The scout machine would carry a heavier load, because it had smaller wings?

Maj. JONES. No, sir.

Senator REED. Heavier in proportion, he means.

Maj. JONES. This machine loading is that of the scout class. It was really designed for artillery observation. It can not be loaded

to that extent. The British load is about 6.5. The more lightly loaded a machine is, the less tendency it has to stall.

Senator REED. This machine we are now speaking of stopped, did it not?

Maj. JONES. Yes, sir; it was heavily loaded, and consequently tricky. When the engine stops suddenly, the machine stalls very quickly and will "spin" easily.

Senator REED. If it had not been so heavily loaded, the man could have gotten out?

Maj. JONES. If it had not been so heavily loaded, he would not have gotten into the spin, although any machine above 7.5 pounds is tricky. If you lose any power at all, the machine stalls very fast. It takes more than the average pilot to fly them. If we were to turn them out now we would have a lot of fatalities.

Senator NEW. Have we built airplanes in this country for service at the front?

Maj. JONES. The D H-4 is to be completed and sent over there.

Senator NEW. Do you know how many of them have been completed?

Maj. JONES. No, sir; I have not the figures on that.

Senator NEW. Nor how many have been sent abroad?

Maj. JONES. No, sir; I have not the figures on that.

Senator NEW. That is one type of so-called combat plane that we have made in this country for use on the front in France, is that correct?

Maj. JONES. That is one type of plane that we have made and completed and sent. I was informed, not officially, that they are sending parts of the Handley-Page. That has not been officially sand-tested or given an official trial.

Senator NEW. Have you tried the Handley-Page abroad?

Maj. JONES. No, sir.

Senator NEW. You said that you were over on the other side?

Maj. JONES. Yes, sir.

Senator NEW. Were you sent over by this Government?

Maj. JONES. Yes, sir. I was sent over to go into training methods.

Senator NEW. That was the purpose?

Maj. JONES. Yes, sir; to learn all I could about training.

Senator REED. When was that?

Maj. JONES. I left in the middle of April and got back in the middle of June.

Senator REED. Of this year?

Maj. JONES. Yes, sir.

Senator REED. After that they displaced you as chief of the flying squadron?

Maj. JONES. Yes, sir.

Senator REED. Who did that?

Maj. JONES. The Chief of Aeronautics.

Senator REED. Who is he?

Maj. JONES. Gen. Kenly, I guess. It came in an order. I do not know who was responsible.

Senator REED. You do not know the reason for it?

Maj. JONES. Officially, I do not. No, sir.

Senator NEW. Do you regard the DH-4 as a satisfactory machine? Just give us your impressions, as a practical aviator, of the DH-4

machine. Tell us for what purpose it is suited, for what purpose it is unsuited, and give us your estimate of the DH-4 as made in this country, in your own way.

Maj. JONES. Any statement I may make on the DH-4 must be affected by what I know the conditions are in our squadron on the front.

Knowing what I do know, I will say that this machine can be used for anything except pursuit work—the single seater—because I know they are using antiquated machines purchased from the French that were discarded by them a year and a half ago. They are using the Sopwith, 1½ strutter. It has been declared unsafe by the French and British for observation work. They are using the AR equipped with the Renault 220, which has a ceiling of only 10,000 feet. They use the Spad two-seater, which is unreliable and unsatisfactory. The 220-horsepower Hispano Suiza was so unreliable and so unsatisfactory that a standing order not to fly the machine more than 6 kilometers behind the Hun lines was issued. They were using a few French Braguet machines and the Sampson, which is a French machine. In comparison with those the DH-4, provided it is satisfactory as determined by service usage, would be a much better machine in my opinion, because it would have a better performance in climbing and in speed. I know that the Liberty is more reliable than the Hispano Suiza 220. On the other hand, no type of machine can be declared satisfactory until service has proved it to be so, not only as regards general construction but also as to all the equipment and accessories that are installed. I know that the British have really developed but few machines that have stood up under service conditions. The Sopwith Dolphin, I was informed, was about to be changed because of structural weaknesses that had developed after long-continued use. This machine was very popular with the British as a single-seater pursuit machine.

Senator REED. Was that equipped with the Hispano Suiza engine?

Maj. JONES. They have about half a dozen different types of Hispano Suiza engines. Any geared Hispano of the lower horsepower is unsatisfactory.

Senator REED. How about the ungeared?

Maj. JONES. They are quite unsatisfactory, but they have built what they call the Hispano Suiza Vyser, that develops something like 200 horsepower or over. I flew a Sopwith Dolphin with one of those.

Senator REED. I notice in this official table which we have been furnished that the Dolphin with the Hispano Suiza engine is given a credit for a ceiling of 23,500 feet.

Maj. JONES. Yes, sir. It is a high-altitude machine.

As an illustration how machines are sometimes proved not entirely satisfactory until long after they have been in service, we can take this particular Sopwith-Dolphin. British fliers informed me while I was abroad that the wings of this machine were failing, due to the fact the machine did not “follow thru” in coming out of a dive. By that I mean if the elevator control is used too suddenly, instead of coming out of the dive in a proper flight path, the machine rotates about its lateral axis, the air strikes the planes at a very high angle of incidence at a very high speed, causing a terrific stress on the wings.

Senator REED. Of course, these gestures you have made can not go into the record. I wish you would translate them into words later on when this record comes to you for revision. That is not a criticism, you understand.

Maj. JONES. Yes.

Senator REED. We are simply trying to get this record in such shape that others who read it may understand it.

Maj. JONES. The reason I spoke of those things was to show how long it takes to develop a type. To say that the DH4 is satisfactory is going too far. I would not say that it is. These things take time to correct. The present machine, as compared to the one to be used in a year from now, will probably be ridiculous.

There is another thing that I do not like about this. They put everything in it. Instead of using it as a day bomber in which you can carry bombs and guns for protection, they have also made provision for a camera. That is for high altitude photographic work. They are also using it for a night bomber, and that seems to me to be ridiculous. It is too fast. They will crash.

Senator REED. In other words, they are trying to use it as a family horse—a horse with which they may go to town, plow, and do various other things.

Maj. JONES. Yes, sir; that is it.

Senator REED. What do our troops need over there now?

Maj. JONES. Anything that will fly.

Senator REED. I mean what should they have?

Maj. JONES. They ought to have the Bristol fighter; they ought to have the DH9; they ought to have the SE5; they ought to have the Sopwith Camel.

Senator REED. How about the Spad? Is that a good machine?

Maj. JONES. It is not as good as the SE5.

Senator REED. What ought they to have in the way of bombing machines?

Maj. JONES. The DH9.

Senator REED. Is that heavy enough for long-distance bombing?

Maj. JONES. That is what the British are using it for.

Senator REED. What about the Caproni and the Handley-Page?

Maj. JONES. They ought to have the big night bomber, the pusher type, but personally I am adverse to the super-Handley with the four motors, because the effective circling is not as high as a dirigible. The dirigible can be shot down because it is not a high altitude machine and because it is not maneuverable. If they can be shot down at an altitude of 14,000 feet I should see no reason why the super-Handley-Page can not be shot down. I would advocate a smaller bombing machine, never with a crew of more than three.

The CHAIRMAN. Your criticism of the Handley-Page has reference to the type which has been produced across the seas, and which was destroyed the other day?

Maj. JONES. Yes, sir; that is the one. It costs a tremendous amount to build it, and the shipping facilities are such that the question should be considered very carefully.

Senator REED. Do you think there would be much danger of hitting a Handley-Page from the ground at an altitude of 10,000 feet?

Maj. JONES. Day or night?

Senator REED. Either one.

Maj. JONES. Very much danger in the day and considerable at night. That is the super-Handley. By that I mean the big four-motor machine. I was in Paris on two bombing raids and I was in London on one bombing raid. The barrages were so effective that the planes never really got over their objectives. The night defense tactics of the pursuit squadrons are becoming effective. When I was in London they shot down seven planes. That was at night, too.

Senator REED. I can understand, of course, how you can get these large planes with another airplane up in the air.

Maj. JONES. But it is very difficult. It is practically impossible to see anything when you are flying at night. You can fly almost next to a plane without seeing it.

Senator REED. I mean that I can understand how they can be struck if you can see them, but as to this barrage, if they are struck during it, it is merely due to the fact that they have the air so filled with missiles that these planes simply come in contact with them, and it is not due to the aim of a single machine.

Maj. JONES. That is true. Most of the German machines have a crew of three.

Senator NEW. How is the German Gotha compared to the Caproni, for instance?

Maj. JONES. I think it has about the same capacity. I haven't the exact figures. I can get them for you if you wish. The Caproni, the Handley-Page, and the Gotha are all about in the same class, as well as I can remember. According to these figures, the largest Caproni weighs 13,755.

Senator REED. Is that the triplane?

Maj. JONES. I think so. The one that the Standard built is 76 feet. That is a shorter one. The gross weight is 10,000 pounds.

Senator REED. The Handley-Page?

Maj. JONES. The Handley-Page is about the same—14,000 pounds; that is, the biplane. The Handley-Page has two motors as against three in the Caproni. The gross weight of the Gotha is about 8,600 pounds. The Caproni that we are now making is 10,000 pounds, and the Handley-Page, as we make it, is 14,000 pounds. As the British make it, it is 12,230.

Senator REED. Is what they call the super Caproni the triplane?

Maj. JONES. That is the super.

Senator REED. Have you seen that?

Maj. JONES. No, sir.

Senator REED. That is the kind they are building for England?

Maj. JONES. I do not believe they are building any for us.

Senator REED. But they are not building it?

Maj. JONES. No, sir; I do not think they are. It is 8,600 for the Gotha against 9,918 for the Caproni and 12,230 for the Handley Page, foreign make. The French Caproni weighs 8,752 pounds.

Senator REED. Then it appears that Great Britain, France, and Italy are using the Caproni to some extent?

Maj. JONES. I did not know that the British were.

Senator REED. I am stating that on other information. I have seen pictures of the super Caproni. It was said that the British had purchased it. What their motives and reasons were I do not know, of course.

The CHAIRMAN. What is your opinion of the Italian SVA scout plane?

Maj. JONES. I have just seen it. I have not flown it. I have not seen it since I have been here. Offhand I would not give an opinion without knowing more about it.

The CHAIRMAN. You are not sufficiently acquainted with it?

Maj. JONES. I have not had any experience with it.

The CHAIRMAN. How long were you at the front, Major?

Maj. JONES. I was in France for one week, but I flew everywhere, so that I got around and covered a great deal of ground that people who were there longer did not cover.

The CHAIRMAN. While you were in France how many American squadrons were flying?

Maj. JONES. When I was in France there were five squadrons actually operating on that front, one pursuit at Dunkirk, two pursuit at Toul, and two observation squadrons at Ourche. This was the latter part of May—the 26th and 27th.

The CHAIRMAN. You mentioned five squadrons. Were they the only ones?

Maj. JONES. At that time that was all. At Amanty there were three or four squadrons waiting for equipment in order to go on the front. At Colombey Les Belles there were more to go. There were in actual operation only five squadrons.

The CHAIRMAN. How many machines were they equipped with?

Maj. JONES. The two pursuit squadrons were equipped with the Nieuport type 28, with 150-horsepower Gnome motors.

The CHAIRMAN. How many machines?

Maj. JONES. They were about to receive a full complement.

The CHAIRMAN. What is a full complement?

Maj. JONES. Eighteen planes per squadron.

Senator REED. How many did they have at that time?

Maj. JONES. I do not remember exactly what they had. The observation squadrons were supposed to have an initial complement of 18 planes per squadron, and a replacement of 50 per cent the first month, and thereafter it was to be at the rate of 33½ per cent. Up to the time I left, which was May 26, the squadron had received one plane for replacement, as I remember it. Of the planes in the first squadron, they only had four machines in commission.

The CHAIRMAN. How about the second squadron?

Maj. JONES. The second squadron was equipped with the French AR. I do not know how many machines they had. I know that the first squadron had not received anything but one replacement. They had been on the front since April 4.

The CHAIRMAN. It is a fact that the line occupied by the American troops is protected by allied flyers as well as our own?

Maj. JONES. Our troops are scattered and mixed up with the French and British all the way up and down the front.

The CHAIRMAN. Then that would follow, as a matter of fact.

Maj. JONES. That would follow, as a matter of fact. The only sectors in which our planes were actually operating were in the Toul sector, and one squadron at Dunkirk.

The CHAIRMAN. That was the 27th of May?

Maj. JONES. That was the 27th of May.

Senator REED. How many should we have for an Army of 1,000,000 men over there? What would be the proportion?

Maj. JONES. The organization has changed so much and it is so uncertain that I can not do other than by giving you an approximation of what I know to be the British. Otherwise I can not say.

Senator REED. Give us that approximation.

Maj. JONES. I do not like to be quoted. This is from memory. I can give it exactly later on.

Senator REED. Do that, please. Supply that information later on.

Maj. JONES. Yes, I can give it exactly. I can gather the information that you want.

Senator REED. I want to know what flying corps we should have for an army of 1,000,000 men.

Maj. JONES. For army of 20 fighting and 10 replacement (base and training) divisions plus corps, army, general headquarters, quarters, and line of communication troops, total, about 1,300,000 men, the American Expeditionary Force program of September 18, 1917, called for 386 service squadrons, 264 park squadrons, and 69 balloon companies.

(Thereupon, at 4 o'clock p. m., the committee adjourned until Thursday, July 18, 1918, at 2 o'clock p. m.)

AIRCRAFT PRODUCTION.

THURSDAY, JULY 18, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2 o'clock p. m., pursuant to adjournment, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MAJ. HAROLD S. MARTIN.

Senator NEW. Maj. Martin, with what branch of the military service are you connected?

Maj. MARTIN. I am in the Department of Military Aeronautics.

Senator NEW. With the rank of major, I see by your insignia?

Maj. MARTIN. Yes, sir.

Senator NEW. By what avenue did you enter the Army? Are you a graduate of the Military Academy?

Maj. MARTIN. I graduated from the Military Academy in 1913 and spent two years with the Infantry, and since then I have been in the Aviation Section.

Senator NEW. Have you been abroad—that is, have you been in France since the United States entered the war?

Maj. MARTIN. I was in France and England from January until May.

Senator NEW. In 1918?

Maj. MARTIN. Yes, sir.

Senator NEW. How did you happen to go abroad?

Maj. MARTIN. It was requested by the chief of the air service, American Expeditionary Forces, that I be sent to France for the purpose of looking into the design of aeroplanes.

Senator NEW. Into the designing of aeroplanes?

Maj. MARTIN. Yes, sir.

Senator NEW. Did you make any recommendation with reference to that subject on your return to this country?

Maj. MARTIN. I was a member of a board appointed by the chief of the air service with three other officers for the purpose of determining what types of airplanes should be produced in the United States for the year 1919.

Senator NEW. Who was the chief of the air service at that time?

Maj. MARTIN. Brig. Gen. B. D. Foulois.

Senator NEW. Gen. Foulois was then in France?

Maj. MARTIN. Yes, sir.

Senator NEW. And the request for you came from Gen. Foulois?

Maj. MARTIN. Yes, sir.

Senator NEW. Who were the other members of the board?

Maj. MARTIN. Lieut. Col. Dodd, Lieut. Col. Harms, Maj. Harmon, and myself.

Senator NEW. Did that board make any recommendations, either while abroad or following its return to this country?

Maj. MARTIN. I brought back the proceedings of the board when I returned to the United States the last of May. Later a cablegram was received from Gen. Pershing stating that the proceedings of the board were approved in principle.

Senator NEW. Gen. Pershing said they were approved in principle?

Maj. MARTIN. Yes, sir.

Senator NEW. What can you tell us about the recommendations of that board?

Maj. MARTIN. Do you want me to go into details? It is quite a long thing. We recommended nine types of machines.

Senator NEW. I would like to know what types of machines were recommended by the board.

Maj. MARTIN. The board recommended nine types of machines to be built in the United States. One was a single seater machine, either a Martinsyde or Sopwith-Dolphin, with the 300 horsepower Hispano-Suiza motor.

Senator NEW. With the 300-horsepower Hispano-Suiza motor?

Maj. MARTIN. Yes. The second was a single-seater machine using the 320 A B C Dragon Fly engine. The exact machine was not definitely determined upon by the board, because three machines are now being built in England and will be tested, and the best one of the three will be the one selected. Another was a single-seater machine using the 170 A B C Wasp engine. The same remark apply to this machine as applied to the other A B C engine. A third was a two-seater pursuit machine using the 300 Hispano-Suiza motor. The machine selected was to be (1) Bristol fighter, (2) an experimental machine with the 320 A B C Dragon Fly.

The CHAIRMAN. Was this report in writing?

Maj. MARTIN. Yes, sir. I was going to suggest that you might have the report in writing.

The CHAIRMAN. Then I suggest that you just put in that report.

Maj. MARTIN. All right, sir.

Senator NEW. We will have it understood then that the report will be made a part of your testimony.

Let me ask you this question: I note that in recommending the Bristol, your recommendation was for a Hispano-Suiza motor to be used?

Maj. MARTIN. Yes; the 300-horsepower Hispano-Suiza.

Senator NEW. The 300-horsepower Hispano-Suiza motor?

Maj. MARTIN. Yes, sir.

Senator NEW. You did not contemplate using the Bristol with the 12-cylinder Liberty?

Maj. MARTIN. No, sir.

Senator NEW. Were the recommendations of your board followed, and if so, to what extent were they followed?

Maj. MARTIN. The proceedings of this board were for the production of machines in the year 1919. The only steps that have been taken so far have been to send a commission abroad to get the drawings and samples of these machines, and up-to-date information

on them. I left England just at the time when most of these machines were about to be tested.

Senator NEW. What types of planes are now being built in this country?

Maj. MARTIN. For training machines, first, the Curtiss J. N.-4D.

Senator NEW. Independently of training machines, I mean.

The CHAIRMAN. Planes other than training planes.

Senator NEW. Yes. What planes other than training planes are being built in this country?

Maj. MARTIN. There is only one machine being made in any numbers in the United States at the present time, and that is the De Haviland 4. One or more of the following machines are being built: Handley-Page, Caproni, Byplane U. S. D. 9, which is a modification of the English De Haviland 9A, and the S. E. 5. Of course, orders exist for large numbers of these machines, but outside of the one or two none have been built.

Senator NEW. You mean, then, that one or two specimen machines are being built for test?

Maj. MARTIN. Yes, sir; and the Bristol Fighter is also being constructed.

Senator NEW. What do you know about the Bristol Fighter having been abandoned?

Maj. MARTIN. I was one of the three officers who lately went to Buffalo to determine exactly what should be done in the case of the Bristol Fighter. We agreed unanimously that production should be immediately stopped on this machine, as it is unsuitable for the purpose for which it is intended, or for any other purpose.

Senator NEW. What were the reasons? Just state briefly the reasons for the recommendation of your board that the Bristol machine be discarded.

Maj. MARTIN. We believed that the Bristol is unsafe; that it will serve no military purpose, and at best will only do what the present De Haviland 4 will do. There seems therefore to be no object in having two entirely different machines which are supposed to do the same thing.

Senator NEW. I understood that this recommendation of your board was to be considered by the production department this morning?

Maj. MARTIN. Yes, sir.

Senator NEW. Do you know whether or not it was considered?

Maj. MARTIN. No, sir; I do not know.

Senator NEW. You do not know whether any action was taken on it or not?

Maj. MARTIN. No, sir.

Senator NEW. Let me ask you this: Was the De Haviland 4 included in the list of machines that you recommended for 1919 production?

Maj. MARTIN. No, sir.

Senator NEW. It was not.

Maj. MARTIN. No, sir.

Senator NEW. Why not?

Maj. MARTIN. The English are substituting the De Haviland 9 and 9-A for the De Haviland 4, and both of these machines are better than the De Haviland 4.

Senator NEW. In other words, the De Haviland 4, you think, is antiquated?

Maj. MARTIN. I think we may say that it is a little behind the times, outside of the criticisms of the machine itself.

Senator NEW. I do not quite understand that.

Maj. MARTIN. I mean there are faults with the De Haviland that we are making that the English De Haviland has not; that there are certain faults in our De Haviland that are not met with in the English De Haviland.

Senator NEW. Can you tell us briefly what they are? Are they structural faults?

Maj. MARTIN. There are certain structural faults which have not yet been corrected. That is the main idea.

Senator NEW. Is anything being done to correct those faults?

Maj. MARTIN. The Department of Military Aeronautics has repeatedly tried to get this information from the production department, but in most cases only general replies have been received, and these replies are often contradictory.

Senator NEW. You mean that you can not get any satisfactory information now from the production department?

Maj. MARTIN. I mean that very often we can not get any information, and from past experience we view most of the information received with suspicion.

Senator NEW. Just what do you mean by that?

Maj. MARTIN. I mean that we get reports as to performance of machines, and when later on we test the machines ourselves there is a big falling off in the reported performances.

The CHAIRMAN. As to speed?

Maj. MARTIN. As to speed and climb.

The CHAIRMAN. And endurance?

Maj. MARTIN. Yes, sir.

Senator NEW. Where are these tests made on which the reports of which you complain are based?

Maj. MARTIN. The tests are made at McCook field, Dayton, Ohio.

Senator NEW. From whom, particularly, do these reports come? I know that they come from the production department, but what individuals, if you can name them?

Maj. MARTIN. We get most of our information of this nature from Mr. Potter, from Mr. Kellogg, and Col. Vincent.

Senator NEW. Col. Vincent is in charge at the field, is he not?

Maj. MARTIN. Col. Vincent is in command of the Airplane Engineering Department and McCook field is really a branch of that department.

Senator NEW. Then, Col. Vincent would send those reports forward to Mr. Kellogg and Mr. Potter, and they would simply again forward the reports that he makes to them; is not that the ordinary course of business?

Maj. MARTIN. Yes, sir; although they sometimes come direct.

Senator NEW. You say that subsequent tests made by your department officially have not sustained the reports made by the testing officers at the field?

Maj. MARTIN. No, sir.

Senator NEW. What has been the character of that difference?

Maj. MARTIN. The reports from McCook field are invariably better than those we obtain.

Senator NEW. They report results, in other words, that you can not obtain. Is that correct?

Maj. MARTIN. Yes, sir.

Senator NEW. Is that universally true or are there any exceptions to that?

Maj. MARTIN. No, sir; I do not think so. It is a difficult thing, of course, to make a very general rule on it. We have received very little from them.

The CHAIRMAN. Speaking in a general way, that is the rule?

Maj. MARTIN. Yes, sir.

Senator NEW. What types of planes are now being built for training purposes?

Maj. MARTIN. The Curtiss JN-4-H, the JN-4-D, and Thomas Morse S4C. They are the only machines which are being built for training at present.

Senator NEW. Other types were built until recently, were they not?

Maj. MARTIN. Yes, sir.

Senator NEW. What were those types?

Maj. MARTIN. The Standard J-1. A great many Standard J-1's were built, the use of which has temporarily, at least, been abandoned.

The CHAIRMAN. Why?

Maj. MARTIN. They are entirely unsatisfactory for training purposes.

Senator NEW. Can you tell us how many of those machines have been abandoned, and where they are?

Maj. MARTIN. I have only hearsay testimony, but I believe the number is around 1,200 or more. They are now in storage in various parts of the United States.

Senator NEW. Those are machines for which the United States has paid and they are now in storage in various fields, and the use of them has been entirely discontinued. Is that correct?

Maj. MARTIN. For the present, at least; yes, sir.

Senator NEW. Can you tell us, approximately, what the cost of those machines was, if you have that figure in mind?

Maj. MARTIN. The prices have varied a great deal. The original price was \$6,500 without the engine, the engine costing in the neighborhood of \$2,500.

Senator NEW. What was the engine used?

Maj. MARTIN. The Hall-Scott 4-cylinder engine.

Senator NEW. Have there been any other types of training planes abandoned?

Maj. MARTIN. There are several types which we used to a certain extent, a limited extent, in training, which are no longer being made; but no other types have been abandoned because of being unsatisfactory.

Senator NEW. I speak of types that have been manufactured in quantity and the use of which has been discontinued after large numbers of them had been accepted.

Maj. MARTIN. No, sir; no others.

The CHAIRMAN. Let me ask you, Major, why these planes were unsatisfactory. Is it due to defects in the materials or structure, or in the engine, or all of them together?

Maj. MARTIN. The engine of the Standard machine is responsible for almost all of the trouble met with.

The CHAIRMAN. Can they be equipped with other engines and be made serviceable, in your opinion?

Maj. MARTIN. I would not recommend using the J-1 as long as the Curtiss JN-4-D was available.

The CHAIRMAN. I am speaking of the Standard. Is the J-1 the Standard?

Maj. MARTIN. Yes, sir. I believe that if the J-1 Standard had a reliable power plant installed, considerable training could be done with that machine.

Senator NEW. What would you regard as a reliable power plant? In other words, what would you regard as a reliable motor? I presume that is what you mean.

Maj. MARTIN. Yes, sir. For a water-cooled engine, the Curtiss OX-2 and the OX-5 are very reliable engines for training purposes.

Senator NEW. Can you approximate what the expense of making that substitution would be, taking the Hall-Scott engine from the J-1 and substituting the Curtiss OX-2?

Maj. MARTIN. It would cost approximately \$3,000 per aeroplane.

The CHAIRMAN. Something over \$3,500,000 altogether for the 1,200 planes.

Senator NEW. You have said, I believe, that you thought the machine could be put to some use.

Maj. MARTIN. Yes, sir.

Senator NEW. With that sort of a substitution?

Maj. MARTIN. Yes, sir.

Senator NEW. Would you then regard it as a first-class training plane?

Maj. MARTIN. No, sir.

Senator NEW. You would not?

Maj. MARTIN. No, sir.

Senator NEW. What types of training planes do you think should be built?

Maj. MARTIN. I believe that training could be satisfactorily done in this country with the following types of machines:

(1) Curtiss JN-4-D, for preliminary training.

(2) Bristol scout or Nieuport, with 80-horsepower Le Rhone engine, for advanced training in pursuit work, the later training in pursuit work to be supplemented by practice with service types.

(3) The VE-7, for training in observation work.

(4) The Curtiss R-4, with the Liberty 12, for training in bomb dropping.

With reference to the Ve-7, the objection to it is that it uses a very expensive engine, which is rather difficult to maintain. It, however, is an existing type and therefore is mentioned.

Senator NEW. Who now determines what types of planes shall be built?

Maj. MARTIN. It is supposed to be the function of the Department of Military Aeronautics.

Senator NEW. You say it is "supposed to be the function"?

Maj. MARTIN. Yes, sir.

Senator NEW. Do they exercise that function or are they interfered with in any way?

Maj. MARTIN. It is only recently that this has been decided to be a function of the Department of Military Aeronautics, and therefore it is difficult to say whether our recommendations will be concurred in. Previously the machines which were produced were determined upon largely by the Equipment Division of the Signal Corps, and they often decided upon types without reference at all to those who were interested.

With the previous organization, of course Gen. Squier was the head, and if he approved of a certain project there was little that could be done, and I believe that machines were built and ordered to be built without reference to what actually should have been built. In other words, I believe it was largely a question of production and not a question of getting the airplanes which would fulfill the requirements.

The CHAIRMAN. It was quantity instead of quality, in other words?

Maj. MARTIN. Yes, sir.

Senator NEW. Maj. Martin, what is the present working arrangement between the production division and the division of military aeronautics?

Maj. MARTIN. The Department of Military Aeronautics is to advise the Bureau of Production what is desired in the way of performance for the different types of machines. The production department is to build the necessary number of sample machines and then submit them to the Department of Military Aeronautics, which will determine whether they are satisfactory or not.

Senator NEW. Does this arrangement work satisfactorily?

Maj. MARTIN. I do not think it can possibly work satisfactorily, for the reason that a great deal of money and time will be wasted. I do not believe that the Production Department includes in its personnel individuals who are competent to decide what should be built and what should not be built. It is, of course, probable that we will eventually get some satisfactory machines, but before that is done an immense amount of time, labor, and money will be expended. The Production Department should include in its personnel officers who can definitely decide whether a machine should or should not be built, and if built, what changes, if any, should be made. As organized at present, they can not do this.

Senator NEW. You think that the absence of officers or officials possessing these qualifications is one of the troubles with the Production Division now, do you?

Maj. MARTIN. Yes, sir.

Senator NEW. Is there any other trouble with it, in your judgment?

Maj. MARTIN. I believe that the Production Department is still entirely too optimistic as to what will be done. Another objection to the present organization is the fact that there is no single head.

Senator NEW. I was just going to ask you what the remedy for it is.

Maj. MARTIN. Another fault with the Production Department, I believe, to be the fact that they have little organization in their department at the present time. It is very difficult to find a man who will decide this or that.

Senator NEW. What do you think the remedy for it is, Major, if there is a remedy?

Maj. MARTIN. There should be a single head to the Air Service. The only remedy for lack of organization is to get some one who will create an organization.

Senator NEW. Is there any organization anywhere that you know of after which we might pattern and whose lines we might follow to good effect or with good results?

Maj. MARTIN. I do not think there would be any mistake in adopting the British organization. Of course, in our entire service we are very short of capable men along the lines of aviation. We have not had enough experience as yet. The English organization, from what I have seen of it, works very well. It is a little slow.

Senator NEW. Can you give us, briefly, an outline of the British organization?

Maj. MARTIN. The head of the British air organization is the air minister. He has a council to advise him. There is, roughly, only one department of the air service in England; that is, they have not two separate branches such as we have. The technical department is a part of production. However, most of the officers or officials in the British air service are men of actual experience in aeronautics, and I believe, of course, that organization is largely a question of individual ability more than any chart which will indicate the different functions. I would suggest that there are at present several British officers in Washington who could give a much clearer and more accurate account of the organization of the British at the present time than I can.

Senator NEW. I think that is all I have to ask Maj. Martin.

STATEMENT OF MAJ. FRANK E. SMITH.

The CHAIRMAN. Maj. Smith, since you last appeared before us, the committee has determined to call you for the purpose of asking, briefly, a few questions regarding the various aviation fields in Dayton. The committee has heard of three fields in Dayton, the Wilbur Wright, the McCook, and the Dayton-Wright Fields. Do you know of any other training field or aviation field at Dayton?

Maj. SMITH. There has been another field authorized, based on a recommendation made by Gen. Squier, on March 28, 1918, at which time he requested of The Adjutant General of The Army that in view of the fact that production was then upon them in aeroplanes every machine should be tested, and that these tests should be made in fields to be acquired at Dayton, Ohio, Buffalo, N. Y., Detroit, Mich., and Elizabeth, N. J., and asked that \$1,047,000 be appropriated for that purpose.

The CHAIRMAN. He asked that of the production board?

Maj. SMITH. No, of The Adjutant General, and that was approved by The Adjutant General and made effective on the 11th day of April, 1918.

The CHAIRMAN. At that time the Government had secured the Wilbur Wright and the McCook Fields, had it not?

Maj. SMITH. Yes, sir.

The CHAIRMAN. While the Dayton-Wright people were using the Dayton-Wright Field for their own purposes?

Maj. SMITH. Yes, sir; at the expense of the Government, however.

The CHAIRMAN. The Dayton-Wright Field, then, is used by the Dayton-Wright Co., but the Government pays the expense by way of rental for that field.

Maj. SMITH. As I understand the situation out there, the experimental field, which is known as the South Morrain Field, is a property which belongs to practically the same people who own the Dayton-Wright factory, but the expense incidental to the buildings and to the experiments that are carried on on that field come under the experimental contract with the Dayton-Wright factory, for which the Government reimburses them.

The CHAIRMAN. Acting upon the recommendation of Gen. Squier and the approval of The Adjutant General, what other field was acquired?

Maj. SMITH. Another field closely adjoining the plant of the Dayton-Wright factory was leased, or a lease was drafted for execution, by the Dayton-Wright Co. The property in question belongs to what was known as the Morain Development Co.

The CHAIRMAN. Who constitute the Morain Co.?

Maj. SMITH. In the course of the negotiations in connection with the lease our approval officer in Dayton was asked to pass upon it, and it developed that Col. Deeds was a stockholder in the Morain Development Co.

The CHAIRMAN. Were Mr. Talbott and Mr. Kettering also stockholders?

Maj. SMITH. Not so far as I know, but I am not informed on that subject. I think not. It was the Schantz estate, as far as we could ascertain. So far as we could find out the balance of the stock in the Morain Development Co. belonged to the Schantz estate.

The CHAIRMAN. That is, exclusive of what Deeds owned?

Maj. SMITH. Yes, sir.

Senator REED. What proportion of the stock did Deeds own?

Maj. SMITH. We ascertained this from Col. Deeds himself. After this matter was referred down to me, I referred it to Mr. Potter, then assistant chief of the Bureau of Aircraft Production. He referred it back and asked me to go to see Col. Deeds, which I did.

The CHAIRMAN. That is, after you ascertained from the authorities out there that Col. Deeds was interested that fact was reported to Mr. Potter?

Maj. SMITH. Yes; reported by myself.

The CHAIRMAN. And Mr. Potter requested you to see Col. Deeds?

Maj. SMITH. Yes, sir. Col. Deeds stated that he was the owner of approximately 25 per cent of the stock, that he was not concerned in securing profits for himself on that particular stock, and if there was any way of doing it he would be very glad to see that the profits were turned back to the Government in the event of the execution of the lease.

The CHAIRMAN. You said, I think, that the lease was made out and sent on here?

Maj. SMITH. Yes, sir.

The CHAIRMAN. That lease was drawn from the Morain Development Co. to whom?

Maj. SMITH. To the Dayton-Wright Aeroplane Co.

The CHAIRMAN. Why was the lease made in that form?

Maj. SMITH. The least apparently was made in that form in order that the Dayton-Wright people might profit not only by the lease but by the expenses in connection with the lease.

The CHAIRMAN. In what respect?

Maj. SMITH. To the extent of 15 per cent, which is the same percentage as they receive under the cost-plus contract.

The CHAIRMAN. That is to say, that the lease as drawn would have resulted in 15 per cent profit plus cost?

Maj. SMITH. Yes, sir. In explanation of that I may say that the Dayton-Wright people proposed that this lease and payments of rental and all expenses in connection with that new field would be considered by them as an element of cost under their cost-plus contract by which the Government would have been obliged to pay them cost plus 15 per cent.

The CHAIRMAN. On that additional expense?

Maj. SMITH. Yes, sir.

The CHAIRMAN. That is, pay them 15 per cent additional on expense account for the manufacture of machines?

Maj. SMITH. Yes, sir.

Senator REED. To state it differently, that means that having had a contract for the manufacture of certain machines on which they were entitled to 15 per cent profit on the moneys paid out and expended by them, they proposed to treat this land and the improvements which were to be made upon the land exactly as though it was money expended in the manufacture of machines.

Maj. SMITH. That is true.

Senator REED. And collect for the mere purchase of that land 15 per cent, or the mere rental of the land, 15 per cent upon the money paid for the rental?

Maj. SMITH. That is correct.

Senator REED. And for the buildings upon the land 15 per cent?

Maj. SMITH. That is correct.

Senator REED. And for the grading 15 per cent, etc.?

Maj. SMITH. Yes, sir.

(Informal discussion followed).

The CHAIRMAN. Did you at any time prior to the making of the South Morain lease make any recommendation to Mr. Potter regarding the general subject of leases to the Aviation Department?

Maj. SMITH. Yes, sir.

The CHAIRMAN. About what date was that?

Maj. SMITH. April 13, 1918.

The CHAIRMAN. What form did that recommendation take?

Maj. SMITH. It took the form of a letter or memorandum to Mr. Potter.

The CHAIRMAN. Can you furnish the committee with a copy of that letter?

Maj. SMITH. Yes, sir; I have a copy here.

APRIL 13, 1918.

Memorandum for Mr. W. C. Potter.

1. Referring to Gen. Squier's letter of March 28, by Col. Deeds, in connection with development of flying test fields, at Dayton, Ohio; Buffalo, N. Y.; Detroit, Mich., and Elizabeth, N. J., which was authorized by the Adjutant General, Roy D. Harper, on April 11, and referring more particularly to Col. Deeds's letter to you of April 12, and letter from the Dayton-Wright Airplane Co., by H. E. Talbott, of April 11, would advise as follows:

2. It is the opinion of this office that all leases of land made for the purpose of these test fields should be made by the Government, and in the name of the Government, with option of purchase by the Government at a later date, if it is deemed advisable by officials of the Government to do so. These leases should be made by some one delegated from the Construction Division in charge of Col. Edgar.

3. It is the opinion of this office that all leveling, grading, seeding, fencing, construction of hangars, shops, or, in fact, any work in connection with these fields, should be conducted by the Construction Division under direction of Col. Edgar.

4. In our judgment contractors should not be permitted to burden cost-plus contracts, or experimental work, supplementary contracts, with any work in connection with these experimental fields, as the Government has the Construction Division, which is competent to take in hand both the leasing of the property and the building of the fields, thereby saving the profit which would otherwise accrue to the cost-plus contractor if the latter is allowed to handle the situation on his own account.

5. The saving involved by having the Construction Division handle this work for us, and assuming that they will make just as good bargains as the contractors could, will be approximately 15 per cent of \$1,047,000, or \$157,000.

6. All papers, including map of the proposed purchase of land for the Dayton field, are returned herewith.

FRANK E. SMITH,
Major, Signal Corps.

The CHAIRMAN. What prompted you to send to Mr. Potter the memorandum of April 13?

Maj. SMITH. Mr. Potter was absent from the city. A letter came in from Mr. Talbott, at Dayton, dated, I believe, April 11, regarding their going ahead with this field. Mr. Potter's secretary brought the original papers to me. He asked my judgment in connection with the matter on the general proposition.

Senator REED. Which field was this?

Maj. SMITH. The proposed new field at Dayton, commonly called the South Morain Field, and also pertaining to the other fields that Gen. Squier had asked for.

The CHAIRMAN. Can you furnish the committee with a copy of that letter of Talbott to the department?

Maj. SMITH. Yes, sir.

THE DAYTON WRIGHT AIRPLANE CO.,
Dayton, Ohio, April 11, 1918.

Mr. W. C. POTTER,
Office Chief Signal Officer, Washington, D. C.

DEAR SIR: Your telegram of the 5th instant regarding flying field.

We have to say that this field has been definitely located as set forth in the accompanying map. It consists of approximately 180 acres. We are having engineers stake out the field for grading and will proceed at once to put it in shape for flying. As a large part of the field is now in condition for flying, no delay will occur in this regard. This work will be rushed to completion.

We understand the hangars for this field will be the standard steel and corrugated iron hangar adopted by the Signal Corps, and will be sent to us to be erected by us. The Dayton Wright Airplane Co. are leasing this ground at a flat rate per annum, but on account of the complications liable to ensue in reference to roads, telephone and telegraph lines, etc., the expense of changing these, if necessary, together with all taxes, must be carried as an expense by the Dayton Wright Airplane Co. in addition to the flat rental. I know this method is contrary to the desire of the Signal Corps, but in this particular instance the owners insist upon these conditions and we have no other recourse than to accept.

It occurs to us that all of this expense can be covered, this work done, and the operations carried on under our experimental contract No. 2713. Please advise if this is satisfactory.

Yours, very truly,

H. E. TALBOTT,
Chairman of the Board.

The CHAIRMAN. In Mr. Talbott's letter I find this statement.

The Dayton-Wright Airplane Co. are leasing this ground at a flat rate per annum. but on account of the complications liable to ensue in reference to roads, telephone and telegraph lines, etc., the expense of charging these is necessary, together with all taxes, must be carried as an expense by the Dayton-Wright Co. added to the flat rental. I know this method is contrary to the desire of the Signal Corps, but in this particular instance the owners insist upon these conditions and we have no other recourse than to accept.

It occurs to us that all of this expense can be covered, this work done, and the operations carried on under our experimental contract No. 2713. Please advise if this is satisfactory.

Is the contract there referred to one under which the Dayton-Wright Aeroplane Co. is permitted to carry a similar expense under its cost plus arrangement?

Maj. SMITH. It is a separate contract, Senator, for experimental work at their South field. It is separate from their regular plus contract.

The CHAIRMAN. But is the expense which the Government incurred in securing that South field under the special contract a basis for cost-plus compensation to the Dayton-Wright Co.?

Maj. SMITH. The basis of the experimental contract No. 2713, as I recall it, is a profit of 12½ per cent.

The CHAIRMAN. In other words, there is the same arrangement, but a different percentage?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Upon receiving this letter from Mr. Talbott, of April 11, you made this recommendation to Mr. Potter, under date of April 13?

Maj. SMITH. Yes, sir.

Senator REED. Is that statement that you make in the letter that the Government had an organization and equipment so that it could transact this business and do this work an accurate statement of facts?

Maj. SMITH. Yes, sir; so far as I know.

The CHAIRMAN. What was the result of that suggestion to Mr. Potter?

Maj. SMITH. The final result has been that Mr. Potter has instructed that all leases for these experimental test fields at the points of Dayton, Detroit, Buffalo, and Elizabeth shall be made in the name of the Government, and that the construction work shall be undertaken and carried on by the construction division, or the name of the division that may take its place in the Government service, thus relieving the contractor of such expenditure and saving the Government the profit that would otherwise accrue.

The CHAIRMAN. Was it also determined to take options for the purchase of the land by the Government?

Maj. SMITH. Not in our conversation. He may have issued detailed instructions.

The CHAIRMAN. But not to you?

Maj. SMITH. No, sir.

The CHAIRMAN. Acting upon that instruction, was the lease from the South Morain Co. to the Dayton-Wright Co. approved?

Maj. SMITH. The new field was to be known as the Acceptance Field, named by the Dayton Wright people. Mr. Potter instructed Mt. W. W. Montgomery to draft a proper lease and to submit it to the General Staff with a notation that Col. Deeds was an interested

party, and ask them to arrange in some manner that the Government might be protected and that the lease might be in accordance with law, as it was necessary, in his opinion, that we have that particular land.

The CHAIRMAN. What action did the General Staff take on Mr. Potter's recommendation?

Maj. SMITH. None as yet.

The CHAIRMAN. None as yet?

Maj. SMITH. No, sir; we have had it up in the last 24 hours.

The CHAIRMAN. As a matter of fact, it has not been completed?

Maj. SMITH. No, sir.

Senator REED. When was this reference made that you speak of?

Maj. SMITH. Starting April 13.

Senator REED. When was it they took the field?

Maj. SMITH. Thereabouts.

Senator REED. That is a field that they have acquired since we went out there?

The CHAIRMAN. It was in process of acquirement then, but nothing was said to us about it.

Has the Government taken possession of the field or the Dayton Wright people?

Maj. SMITH. Not officially.

The CHAIRMAN. Have they actually?

Maj. SMITH. No, sir; I think not.

The CHAIRMAN. Has the Government expended any money upon it?

Maj. SMITH. The Government has spent no money itself.

The CHAIRMAN. Now, Major, to which of the other fields at Dayton was the lease made to the Dayton Metal Products Co.?

Maj. SMITH. The McCook Field.

The CHAIRMAN. Does it still stand that way?

Maj. SMITH. The original lease was dated November 16, 1917, and was to run until July 1, 1918, at which time it was to be extended for such period as the Government might desire. I have no information as to what has been done since July 1, 1918.

The CHAIRMAN. Then, so far as you know, that lease is a lease from the owner of the ground to the Dayton Metal Products Co.?

Maj. SMITH. Yes, sir. The Government paid the Dayton Metal Products Co. something over \$9,500 for six months' use of the field, from January 1 to July 1, 1918.

The CHAIRMAN. Do you know whether the expense to which the Government has gone in preparing that field for the purpose for which it was secured is used as a basis for profit to the Dayton Metal Products Co.?

Maj. SMITH. No, sir; that was not true. The expenditure on the land and the erection of buildings was all performed by the Government at the Government's expense.

The CHAIRMAN. And with which the lessee has nothing to do?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Can you give the committee a statement as to the amount of money expended up to date by the Government upon McCook field?

Maj. SMITH. Up to the 1st of July there had been expended at McCook field for land and buildings—that includes rental of the land, grading of the land, and the buildings placed thereupon—

\$750,000. There had been expended in upkeep and the maintenance of McCook field, \$2,040,000, or a total of \$2,790,000.

The CHAIRMAN. Of what does that consist?

Maj. SMITH. I have not the details.

The CHAIRMAN. I mean, generally speaking.

Maj. SMITH. It will include testings that are carried on there, the pay roll, and miscellaneous supplies.

Senator REED. Those things ought not to be put into the price of the field because that is really a matter of expense incident to the war?

The CHAIRMAN. Yes; that is my reason for asking the question. That is an unavoidable expense, perhaps. But, so are they all.

Now, tell us about the Wilbur Wright field.

Maj. SMITH. The total expenditure at the Wilbur Wright field, for which I have not the buildings separately, is \$2,800,000, or approximately the same as at McCook field.

The CHAIRMAN. Does that include the large warehouse which adjoins the Wilbur Wright field?

Maj. SMITH. It does not include the large warehouse, which is entirely separate from building construction.

The CHAIRMAN. Have you the figures on that?

Maj. SMITH. I can put them in the record later. I might add that at the Wilbur Wright field there is a gunnery school that had expended up to July 1 a total of \$2,087,000.

Senator REED. That was not included in the figures which you gave?

Maj. SMITH. No, sir. That makes a total expenditure at the Wilbur Wright Field of \$4,887,000 up to July 1.

Senator REED. When you get those figures straightened out so that we will know what is in the nature of the creation and maintenance of the field proper, I would like to have them in the record.

The CHAIRMAN. In other words, Senator, you want it itemized?

Senator REED. I want to know the cost of the field, not what has gone upon the field.

The CHAIRMAN. You can add that later on?

Maj. SMITH. As near as I can get at it now, the cost of the buildings and land at McCook Field was \$750,000 on July 1.

Senator REED. How many acres of ground?

Maj. SMITH. Two hundred.

Senator REED. Have we a contract for the purchase of that ground?

Maj. SMITH. I have a copy of the lease here. There is no mention made of the Government's right to acquire this property under the lease.

Senator REED. Do you know of any separate contract giving that right?

Maj. SMITH. No, sir; but the lease in question expired July 1, 1918. I am not familiar with the renewal, although there are renewal clauses in here for the next three years.

Senator REED. That is the Wright Field?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Did you have similar experiences with the locations of the new fields provided for in the order of last March at Buffalo, Detroit, and Elizabeth?

Maj. SMITH. No, sir.

The CHAIRMAN. No such suggestions were made with regard to them?

Maj. SMITH. No, sir.

The CHAIRMAN. Is there any purchase privilege in the Wilbur Wright Field contract?

Maj. SMITH. Our file copy of the lease at the present time is in the hands of the Department of Justice. It is not available to me just now, and I can not answer that question.

The CHAIRMAN. That is to say, Mr. Hughes has that lease?

Maj. SMITH. Yes, sir.

Senator REED. Maj. Smith, can you tell us how much money has been expended on the production of the Liberty motor?

Maj. SMITH. Yes, sir.

Senator REED. I will thank you if you will give us that statement later on.

Maj. SMITH. I will see that a statement of that sort is submitted to you

**STATEMENT OF SERGT. ALEXANDER KLEMIN, M. S. E.,
EIGHT HUNDRED AND SEVENTH AERO SQUADRON, MCCOOK
FIELD, DAYTON, OHIO.**

Senator NEW. State your name to the stenographer, please.

Sergt. KLEMIN. Alexander Klemin.

Senator NEW. You are a sergeant in the Aviation Section?

Sergt. KLEMIN. Yes; in the Signal Corps. That is what I am enlisted as. I am in the Air Service now.

Senator NEW. Stationed at what point?

Sergt. KLEMIN. McCook Field.

Senator NEW. In what capacity?

Sergt. KLEMIN. I am in charge of the aeronautical research department, M. S. E.

Senator NEW. What experience have you had that qualifies you for that position?

Sergt. KLEMIN. I was in charge of the department of aeronautical engineering at the Massachusetts Institute of Technology and was consulting engineer to a number of companies.

Senator NEW. Name some of them?

Sergt. KLEMIN. The L. W. F. Engineering Co., the Connecticut Aircraft Co., and I did some work for the Standard Aeroplane Corporation and a number of other companies. I did work for them at different times.

Senator NEW. I want to ask you if you will please state the relation of engineering to production.

Sergt. KLEMIN. Do you mean the aeroplane engineering department as it now stands?

Senator NEW. Yes, sir.

Sergt. KLEMIN. The main work at the field is getting the English design and turning it into an American proposition, so that we get all the English drawings with the English motor, and we adapt that to the Liberty 12, or whatever motor we intend putting in. We build three of these ships at McCook Field while working out the drawings, or as soon as we finish the drawings, and if the ship turns out satisfactorily, and so on, why, the drawings will be turned over

to the Director of Aircraft Production, and I suppose from there they will go to the production engineering people, but I have no official knowledge of that. I know what we do. We get these machines ready for production.

Senator NEW. If your effort with your initial machine is satisfactory, then the drawings are turned over to the production department upon which they are to proceed in order to get production in quantity?

Sergt. KLEMIN. I presume so. I have no knowledge of procedure, because I am interested in purely technical work.

Senator NEW. What use has been made of such aircraft talent as we have in this country in the designing and production of aircraft here?

Sergt. KLEMIN. I now speak mainly from hearsay, sir, because the original attempts to secure aircraft talent in this country occurred before I joined the service, and I was not much concerned with what the Government did in that sort of thing. As far as I know, they tried to get man like Charles Day, of the Standard Corporation, to take commissions. Those men, earning, say, \$10,000 a year as chief engineers—and Mr. Day's case is a concrete case—and probably earning just as much from their shares of their stock, and so on, were not altogether anxious to enter into the Government service. That is one concrete case that I know. The same thing happened with one of Mr. Day's assistants. They did, however, take in as many as they could, but there are very few men in the country who know anything about aeronautics.

Senator NEW. What do you know, if anything, about the replacement of the people who did know something of aviation engineering by automobile engineers and others like them, who have had no experience with aviation matters?

Sergt. KLEMIN. I think there was a tendency amongst automobile engineers who, in some ways, were well qualified to enter the industry, to underrate the difficulties of building an aeroplane, and who thought that if they started in and got an English drawing and so on, they could probably turn out as good a machine as the airplane engineers.

Senator NEW. Has that belief on their part been borne out by the facts?

Senator KLEMIN. Well, I think possibly that the air-plane engineers might have made a quicker job of certain things.

Senator NEW. Will you tell us why it was that Lieut. Col. V. E. Clark was blamed for the defects in the Bristol fighter?

Sergt. KLEMIN. I have no information that is accurate enough to answer that question. I was not in Col. Clark's office at the time. Since I have been at the field we have had nothing to do with the Curtiss Bristol fighter. The only Bristol fighter we have been interested in is the Bristol fighter with the Hispano-Suiza engine.

Senator NEW. Do you know anything of the special difficulties under which Lieut. Col. Clark labored in that matter, with reference to the development of the Bristol fighter?

Sergt. KLEMIN. No, sir; I have not any knowledge of that.

Senator NEW. I thought, Mr. Chairman, that the sergeant had special knowledge on this particular point, and that was the principal reason I summoned him here.

Senator REED. You say you have had to do with the Bristol fighter that uses the Hispano-Suiza engine.

Sergt. KLEMIN. Yes, sir.

Senator REED. To what extent have you had experience of that kind?

Sergt. KLEMIN. We have had the English Bristol fighter out on the field, sir, and I helped to run the performance test of that machine, and I also helped in designing that ship for American production.

Senator REED. Did the machine that you got from England with the Hispano-Suiza engine in it do good work?

Sergt. KLEMIN. Yes, sir.

Senator REED. You then made the machines from that?

Sergt. KLEMIN. We are now making them.

Senator REED. Did you ever make one and complete it and use it?

Sergt. KLEMIN. No, sir. That will be done in a couple of months' time.

Senator REED. You find the English Bristol fighter equipped with the Hispano-Suiza engine a satisfactory machine?

Sergt. KLEMIN. Yes, sir. It is no faster than the DH4, but it is more maneuverable, and I think it is a good combat machine.

Senator REED. Do you think you are going to have difficulty in reproducing that flying machine in this country, or do you think you can put the Hispano-Suiza engine in it and make it all right.

Sergt. KLEMIN. I do not think we are going to have the slightest difficulty.

Senator REED. You are not going to put in the Liberty 12?

Sergt. KLEMIN. I think the Bristol fighter was not built originally to take such a big motor. It was built for a motor of about 200 horsepower of 300 horsepower. They fit very well, but if you start to put in a 400-horsepower engine into a plane which was originally designed to take a 200-horsepower engine you are going to get into difficulties right off the bat; that is to say, whoever decided to do that made a radical mistake.

Senator REED. What does that mistake consist in?

Sergt. KLEMIN. For a certain size plane and a certain size of area of wings, you can have an engine of so much horsepower and no more. For instance, if somebody had brought out an 800-horsepower engine and told me to put it in a DH-4, I would say it was impossible.

Senator REED. It would be impossible because it would have what effect?

Sergt. KLEMIN. There is a vicious circle. If you put too heavy an engine into the plane you have first the extra weight of the engine, and of course the whole plane weighs more. Then you ought to have more wing area.

Senator REED. And if you do not, what happens?

Sergt. KLEMIN. She is overloaded.

Senator REED. And the pressure is too great?

Sergt. KLEMIN. The landing speed is too great. You may get through the air all right, but you land at too high speed. If you take an engine that is too heavy and do not make proper allowance for wing area and the size of the plane you have this vicious circle, and you end by making a mess of the whole thing.

The CHAIRMAN. Then there is the increase of the propeller blast, too.

Sergt. KLEMIN. That might be taken care of.

Senator NEW. Is it not true that the increased strain put upon a machine by putting in it a motor of much heavier horsepower than the one for which it was originally designed is apt to make it a dangerous proposition?

Sergt. KLEMIN. Yes, sir; it is.

Senator REED. Would it not be likely, if you put in a motor heavier than the machine was designed for, and also more powerful, to wreck the wings or tear the canvas off, and make some of the parts give way?

Sergt. KLEMIN. It might very well do that. You would have to study the whole thing afresh. You would have to examine every spar and strut in the machine afresh to see whether you had reached the limit. Although I have never made a stress diagram of the Bristol fighter myself, I can imagine that if you take a 400-horsepower engine and put it in it, you will make it unsafe. I am not making that argument based on that particular machine, but just on general principles which are true in the case of any machine.

Senator NEW. Do you know why the Bristol scout was not built?

Sergt. KLEMIN. No, sir.

Senator NEW. Do you know why the Martinsyde was not built?

Sergt. KLEMIN. No, sir.

Senator REED. Now, as a matter of fact, is it not true that the men who have had experience in flying have had very little to do with production?

Sergt. KLEMIN. Col. Clark had some experience. Do you mean production or designing?

Senator REED. I mean in the production of the machine and the inspection of the work of getting it produced.

Sergt. KLEMIN. Yes. I think on the whole they have had little to do with it. The difficulty is that the flyers and engineers are generally two different types of men and the best flyer is not always the best production man. You can not utilize him in production, although he thinks he can run a factory.

Senator REED. But an engineer who understands the stress and the strain that have to come on the machine, the balancing of the parts, and all that, ought to be given a very large part in the production, ought he not?

Sergt. KLEMIN. He ought to be given a very large share of the work of designing the machine and the getting out of the drawings, and then he ought to be able to go through with the tests.

Senator REED. The inspection ought to be supervised by a man of that type.

Sergt. KLEMIN. He ought to take a general interest in the inspection, but it is too big a job to design a plane and carry on production and inspection at the same time.

Senator NEW. I think it was rather with reference to designing than production that you asked the question.

Senator REED. Yes.

Sergt. KLEMIN. In designing it is almost impossible to find a man who has all the various matters which have to be considered at his fingers' tips. They are men whose temperaments differ. There are men of certain temperament who are best fitted for one part of the job and one man can hardly take care of the whole matter. You ought to give the designer large scope and then let the flyer give his

opinion of it. The flyer, by the way, should be as highly trained a man as you can get. If an ordinary automobile flyer goes up and then comes down, he tells you things that are of no value to you at all. If, on the other hand, you get a flyer with a technical education, or some kind of an Army officer with large experience in the air, and also a technical education, to start with, although he may not be a good designer, his opinion is valuable. He can talk to you in more technical language and understand you better than the pilot who is simply a pilot.

The CHAIRMAN. When did you first enter the Government service?

Sergt. KLEMIN. I enlisted on November 27, 1917.

The CHAIRMAN. You enlisted in the Aviation Service?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. From what State?

Sergt. KLEMIN. I enlisted in Washington.

The CHAIRMAN. Here?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Were you employed in Washington in the Aviation Service before——

Sergt. KLEMIN. Before going into the service proper, sir, I was employed by the Navy as an expert. I used to come up to Washington.

The CHAIRMAN. Where did you live at that time?

Sergt. KLEMIN. Boston.

The CHAIRMAN. How long have you lived in Boston?

Sergt. KLEMIN. Three years.

The CHAIRMAN. When did you take your course at the Boston Technological School?

Sergt. KLEMIN. I graduated in 1915. I mean, I took the post graduate course in 1915. That is the only one that concerns aeronautics.

The CHAIRMAN. Where were you when the war broke out?

Sergt. KLEMIN. In England.

The CHAIRMAN. When the war broke out between England and Germany, I mean?

Sergt. KLEMIN. I was in England, sir.

The CHAIRMAN. How long had you been in England at that time?

Sergt. KLEMIN. I had been in England for about 15 years.

The CHAIRMAN. What was your business over there?

Sergt. KLEMIN. I was teaching and consulting engineer.

The CHAIRMAN. Then you came over after the war began and took the course in technology?

Sergt. KLEMIN. Yes, sir. I had made all arrangements to come over here.

The CHAIRMAN. You had made arrangements before the outbreak of the war to come over?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. How long had you been engaged in aviation in Great Britain?

Sergt. KLEMIN. I was engaged in it but not in a direct way. I was engaged in this way, that people would come in to see me. I had a small consulting practice, and people would come in to ask me to help them out in the reports that came out.

The CHAIRMAN. Are you a native of England?

Sergt. KLEMIN. No, sir; Russia.

The CHAIRMAN. What is your age?

Sergt. KLEMIN. Thirty.

The CHAIRMAN. Did you go to Germany or to Austria between the declaration of war and the time you came over here?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Have you ever been in that country?

Sergt. KLEMIN. I think I have been one day in Strassburg.

The CHAIRMAN. Just one day?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Was that before the declaration of war?

Sergt. KLEMIN. Yes, sir. That was when I was a boy.

The CHAIRMAN. When did you leave Russia?

Sergt. KLEMIN. I do not know. It was at the age of 3 or 4 years.

The CHAIRMAN. And you came to America?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Have you been naturalized?

Sergt. KLEMIN. Yes, sir; three months ago.

The CHAIRMAN. When did you declare your intention to take out papers?

Sergt. KLEMIN. I suppose it was three and a half or four years ago.

The CHAIRMAN. That was while you were staying in Great Britain?

Sergt. KLEMIN. No, sir; while I was here.

The CHAIRMAN. While at the Boston Technological School?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Where did you make your declaration?

Sergt. KLEMIN. At Boston.

The CHAIRMAN. Was it your intention to become a citizen of the United States before the war broke out?

Sergt. KLEMIN. I had always intended to come to the States, sooner or later, to live.

The CHAIRMAN. When you and your parents left Russia, you left with no intention of returning?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Your parents came with you?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Did your father take out naturalization papers?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Where did he live in America?

Sergt. KLEMIN. In San Francisco.

The CHAIRMAN. And were you educated in San Francisco?

Sergt. KLEMIN. No, Sir; in England.

The CHAIRMAN. How old were you when you left your father's domicile?

Sergt. KLEMIN. He is over in England now.

The CHAIRMAN. Your father is still living?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. How long since you have been a member of his household?

Sergt. KLEMIN. I do not know.

The CHAIRMAN. In other words, when did you go to work for yourself; that is what I mean.

Sergt. KLEMIN. Ten years ago, I suppose.

The CHAIRMAN. You are now 30 years of age?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Did you have anything to do while in the service of the Navy or the naval department of aviation, or the Army down here, with the drafting of designs?

Sergt. KLEMIN. While I was at Boston I was in charge of the wind tunnel. Dr. Hunsacker found that he wanted somebody with my training to help him out on certain dynamical problems and so he made an arrangement by which I should come to Washington to help him out.

The CHAIRMAN. That is the extent of your experience here in the matter of designing for the Government?

Sergt. KLEMIN. Yes, sir. Previous to that I designed machines for private firms.

The CHAIRMAN. How long have you been at Dayton?

Sergt. KLEMIN. I have been at Dayton since December.

The CHAIRMAN. Do you know Commander Barry?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Do you know an aeronautical engineer by the name of Crane?

Sergt. KLEMIN. Of the Simplex Co.?

The CHAIRMAN. Yes, I believe so.

Sergt. KLEMIN. I have met him several times. I can not say that I know him very well. I have met him.

The CHAIRMAN. Do you know a man by the name of White?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Have you heard anything about the recent establishment of a board of purely aeronautical engineers for the purpose of passing upon these various planes that are being made and making suggestions with regard to improved designs?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. I think that is all.

Senator REED. You are now drawing a sergeant's pay?

Sergt. KLEMIN. Yes, sir.

Senator REED. You made very much more than that before you enlisted?

Sergt. KLEMIN. Yes, sir. I was making about \$9,000 a year, but I got worried.

The CHAIRMAN. Are you a man of family?

Sergt. KLEMIN. No.

Senator REED. You mean you wanted to get into the service?

Sergt. KLEMIN. I was trying to work for the institute and the Navy and was running two schools, and I made a mess of it.

The CHAIRMAN. I think that is all.

(Whereupon, at 4 o'clock p. m., the committee adjourned until Friday, July 19, 1918, at 2.30 o'clock p. m.)

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., July 29, 1918.

Hon. C. S. THOMAS,

*Chairman Subcommittee Committee on Military Affairs,
United States Senate.*

MY DEAR SENATOR THOMAS: Herewith find copy of letter to Hon. John D. Ryan, chairman Aircraft Production Board, Washington, D. C., delivered by us to his secretary July 17, 1918, in accordance with the conversation our secretary had with Mr. Ryan on July 12, 1918, which we herewith request be made a part of our testimony, attached to the copy of the testimony of Mr. Mois H. Avram, dated Friday, July 19, 1918.

This letter covers the negotiations our secretary had, representing us, with Mr. Ryan, Mr. W. C. Potter's assistants, Mr. M. W. Kellogg, and Mr. Kellogg's assistants, Lieut. Col. Bane, Maj. H. S. Martin, and Lieut. W. W. King, Military Aeronautics Division, United States Army.

This letter was written with Mr. Ryan's concurrence, after Mr. Ryan had stated that the reason the Wittemann-Lewis Aircraft Co. did not secure a contract in the past from the aircraft authorities of the Government was due to the belief that the Wittemann-Lewis Co. was a small company, with a small organization, which did not have the facilities to manufacture planes in a large way. The statement of Mr. Ryan above quoted was a conclusion which he formed after our secretary's original interview with him on June 17, 1918. At that time Mr. Ryan said to our secretary:

"This is the first time I have ever heard of the Wittemann-Lewis Co., therefore, of course, I do not know anything about it. I shall see Mr. Potter at noon, and we will go to the bottom of this and get all the facts, and see why this company did not get a contract. We shall see if there is any good reason."

Also find herewith copy of the testimony of Mr. M. H. Avram and Mr. Paul Wittemann, which we return, according to your instructions, with corrections and additions attached thereto.

Yours, very respectfully,

THE WITTEMANN-LEWIS AIRCRAFT CO.,
By REDMOND F. KERNAN, *Secretary*.

WITTEMANN-LEWIS AIRCRAFT CO. (INC.).
Newark, N. J., July 17, 1918.

Hon. JOHN D. RYAN,
Chairman Aircraft Production Board,
Washington, D. C.

MY DEAR MR. RYAN: I am indebted to you for the interviews I have had in connection with the interests of the company that I represent. On July 12, after our conversation, you expressed a willingness to receive a communication from me in review of statements I had previously made. I am furnishing it in what follows.

The distinctive factors of our company, together with the features of its product that we rely upon for recognition by the Aircraft Production Board, are as follows:

1. The Wittemann brothers have had experience in flying airplanes from boyhood.
2. We have been manufacturing airplanes for 12 years.
3. These airplanes have had recognition from the Aeronautical Society and have been flown by flyers of unquestioned reputation, such as Allan Adams, formerly chief instructor at Mineola; Edward Stinson, chief tester for Curtiss Aeroplane Co.; Capt. Thomas S. Baldwin, United States Army; Ensign Clinton D. Backus; Leonard W. Bonney; John Petrie; Bud Mars; George W. Beatty; Sergt.-Pilot Dean; Ivan Lamb. R. F. C.
4. Mr. Lewis, of our corporation, has been an instructor in flying in this country and in Europe.
5. Since 1917, as an integral part of our management and in production, Mr. Avram, of Slocum, Avram & Slocum, has had daily active connection with the company.
6. The completed organization of our company has been made ready to meet the requirements of quantity production under Government contracts, accompanied with the usual specifications of the Aircraft Production Board.
7. This corporation is exclusively engaged in the production of aircraft; it has never had any other kind of business and desires none other.
8. Its planes have met the tests of practical flyers and Government experts.
9. "Quality" and "Safety First" have been our watchwords.
10. The Wittemann-Lewis Aircraft Co. has no casualty list; there has been no death nor serious accident to a flyer of any of its planes.
11. The combined talent of the Wittemann-Lewis Aircraft Co. and Slocum, Avram & Slocum, enables the former to build any type of aircraft, to furnish ample resources, and to perform and dispatch its work to meet emergency requirements of the Government.

For the purpose of correcting some wrong impressions about the company, and particularly the impression that it is a small organization incapable of producing airplanes according to the specifications of the Aircraft Production Board on an equitable contract, or in any other manner the Government desires its aid in winning the war, I make the following running comment for your information, with copies of some letters and other documents.

Covering a period of over two years, this corporation has, at no inconsiderable expense, done everything within their power to acquaint the Government with their experience and knowledge of the aircraft art, their exceptional manufacturing ability, and their strong desire to aid the Government in building competent airplanes to help win the war.

The record of the negotiations to date would seem to show conclusively upon its face a lack of continuity in reaching a proper estimate of the merits of the company, largely due to shifting its consideration from one representative of the Government to another. With no desire whatever to make animadversion, it will be necessary to speak of persons as I go along. In a conversation I recently had with Mr. Morris W. Kellogg, assistant production manager of the Aircraft Production Board, in reply to my question as to why the Wittemann-Lewis Aircraft Co. was not given a contract, he said, "I do not know." When I asked him what this opinion of the matter was, he said, "Personally, I think it is a damned shame—a damned outrage that they didn't get a contract."

Similar expressions of opinion have been heard from other patriotic men who have endeavored for months past to secure governmental recognition of the aircraft manufacturing ability of the Wittemann-Lewis organization, combined with the mechanical engineering and productive power of Slocum, Avram and Slocum.

Capt. J. K. White, head of the Legal Department, Aircraft Production Board, who conducted the investigation inaugurated as a consequence of the charges preferred by Mr. Moïs H. Avram in his letter to Mr. Howard E. Coffin, chairman, the Aircraft Board, April 17, 1918, made a favorable report on the ability of the Wittemann-Lewis Aircraft Co. Capt. White stated to me that in his opinion the Wittemanns did not receive a contract because the impression was conveyed to the members of the Aircraft Board that the Wittemanns were seeking to secure the consent of the Government to adopt their own particular designs of aircraft, and not that they sought a contract with the Government to manufacture aircraft according to the plans and specifications of the Aircraft Board.

As a result of the above investigation and the facts brought out, Mr. W. C. Potter, production manager, Aircraft Production Board, believed so strongly in the ability of the Wittemann-Lewis Aircraft Co. to produce aircraft satisfactorily to the Aircraft Production Board that he promised Charles R. and Paul W. Wittemann that he would allow them to figure on some drawings of aircraft which he expected to receive by May 15. In order to confirm this detail of his conversation with the Wittemanns, Mr. Potter called in his secretary and dictated a memorandum, the substance of which is about as follows:

"The Wittemann-Lewis Aircraft Co. is to receive drawings of either the Bristol or De Haviland machine to figure on from 250 to 500; or else the Handley-Page or Caproni machines, to figure on as many as they will have capacity for. These drawings will be sent to them immediately upon completion May 15."

Mr. Potter promised to mail the Wittemanns a copy of this memorandum. We have not received it up to date. The drawings referred to were never received. The promises were not fulfilled.

In reference to the statement that the Wittemann machine was not acceptable to the military aeronautics division, the following are the facts as we understand them: The completed report has been made in secret, and a copy of same has been denied us. Capt. Grant, Mr. Kellogg's assistant, said that the blue prints of the Vought training machine, which were promised to be delivered to us to figure on June 15, would not be ready for delivery until about July 15, and that the reason for this delay was because Mr. Vought, the inventor, was suffering from an attack of appendicitis.

I told Capt. Grant that from what Charles R. Wittemann (whom I considered one of the best aircraft engineers in the country) had stated to me. I believed the large number of deaths occurring daily among aviators in the Army service was due in part to the lack of perfection in design and manufacture of some of the training machines they were compelled to use. Capt. Grant demurred to this, and said in addition that the Vought blue prints they were waiting for were believed to be improvements on the machines they were now using, and, further, that improvements were constantly being made in all machines used in training. Following my statement that we had three new training machines in our factory, which we considered superior to the training machines now in use, and that it was a strange system which would not consider giving them a trial to demonstrate their efficiency because of the illness of the inventor whose blue prints had been accepted in secret, Capt. Grant suggested that we send our machine to McCook Field, Dayton, Ohio, for trial. We agreed to do this. Before we could go on with the matter our plane had to be inspected at our factory. On June 28 Mr. Kellogg ordered this plane inspected. The matter then passed from the jurisdiction of the Aircraft Production Board to the Military Aeronautics Division.

Lieut. W. W. King made the inspection July 2. Our factory report shows that he carefully inspected the machine and spoke favorably of its strong and efficient construction, and particularly of our plans for production. He made no unfavorable criticism. He asked for drawings showing the wing fittings connecting the wings to the fuselage, for filing purposes and also for checking. He stated that he would recommend an Hispano-Suiza motor, believing the machine would be an excellent one for advanced training, with that make of motor. Lieut. King had flown our original machine at Mineola, L. I., when he was in training at that station and was well acquainted with our workmanship. He was satisfied with that machine and stated that he always said we manufactured a good machine. He also examined several other machines and flying boats we had at the factory. His only criticism of the particular training machine which he was detailed to inspect was that he thought it might be necessary to install "stick" control instead of Deperdussin control, which was only a minor change that could be installed quickly; and he also thought the direction rudder appeared to be a little large. Upon leaving, Lieut. King said he would like to have an opportunity to try out this particular machine, and, if possible, fly it to Dayton, saying he believed it would be a very easy trip for it to make and that he felt it would prove up in every respect. These statements of Lieut. King show clearly that the machine had passed his inspection and that his report would be a favorable one. It was a favorable report.

Lieut. King's written official report was made to Maj. H. S. Martin. On July 12, 1918, Maj. Martin personally told me Lieut. King's report was favorable and that his own report was unfavorable, and that in making his (Martin's) report he had in mind also his "personal inspection of the same machine last year at the Mineola flying field, and that his report at that time was an unfavorable one." Maj. Martin also said that his own report stated they had enough types of training machines now and that they did not want another.

I told Maj. Martin that the machine which Lieut. King inspected and reported favorably upon was not the same machine which he had personally inspected last year, but was an improvement upon that machine; that the machine which he had inspected last year and had reported unfavorably had, however, since that inspection made over 300 flights, had never killed anyone, never had an accident, and that there had not been an expenditure of a single cent for repairs on this machine. I said that this was eloquent testimony to the engineering and manufacturing ability of the Wittemann Bros., and especially of their knowledge of this modern day art.

I have the most absolute confidence in the honesty and integrity of Regular Army officers, I do not believe there was any malicious prejudice in the mind of Maj. Martin when he put his unfavorable report against the favorable report of Lieut. King, but I do believe there was in his mind a subconscious prejudice against our machine and in favor of a machine the blueprints of which are not at this writing completed, and if accepted is to take the place of the training machines now in use. His personally knowing the inventor of the other machine, and his intimate acquaintance with that machine has no doubt affected his judgment. Is not the system which admits of such a condition wrong? Is it not unfair to Maj. Martin and ourselves? Words fail me when I see that its results put at risk unnecessarily the lives of so many of our young aviators now in training. Look at the list of deaths daily, from the use of the present type of training machines, and then think that the system under which these machines are used may leave the decision as to the proper type to any one man. The thought to me is appalling.

This decision should be made by a board composed of the greatest aeronautical engineers in the world. The men who decide on the production of machines by experimental manufacturers should by law be compelled to personally fly in the type of machine they order for our soldiers to fly and risk their lives in.

The millions of American citizens, whose sons are now in, or about to join our Army, would favor such a law, and condemn one inexperienced man's opinion as the court of last resort in the selection of a particular type of training machine.

That we are new and inexperienced in war, is a lame, inefficient excuse for this one-man system.

When the righteous wrath of American fathers and mothers is aroused over the shortcomings of this system, no man or set of men in our Government can stand up and hide behind the words, "I did not know."

The American people may stand now for a waste of material and money. They will never stand for the waste of the lives of the young and innocent men and boys who are cheerfully giving up their lives so that the world may live.

As against the report of Maj. Martin, read copy of a letter written by Sergt.-Pilot D. I. Lamb, Royal Flying Corps, who was a stranger to our company, and its engineers and builders, when this letter was written:

NEW YORK, June 6, 1918.

WITTEMAN-LEWIS AIRCRAFT CO. (INC.), Newark, N. J.

GENTLEMEN: It gives me great pleasure to give you my opinion of your machine that I flew over the city of Newark dropping Liberty Loan literature.

It is the easiest machine to handle either in the air or on the ground that I have ever flown—and I have flown more than 40 types.

I do not believe it possible to build an easier machine to land as it is very stable and has an extraordinary slow landing speed.

The machine flew itself while I was dropping literature with both hands although there was a very bumpy wind. The only control I used while circling over the city was the rudder and found the machine would take the correct bank on turns without any other effort on my part.

Both the climbing and gliding angles were excellent and the machine showed very high speed considering the engine power and the load carried.

The design, workmanship, and reliability leaves nothing to be desired for any purpose, even war, if a larger power plant were installed.

Thanking you again for the pleasure of flying your machine and other courtesies, I remain,

Very sincerely, yours,

D. I. LAMB,
Sergeant-Pilot, Royal Flying Corps.

How consistently this letter agrees with Lieut. King's report as to the qualifications of an up-to-date flying machine. We could produce many more similar letters from actual flyers, who know nothing about the intricacies of finances, piano or automobile manufacturing, or their connections with aircraft production as a power for winning the war.

In December, 1917, Lieut. Ridlon made an investigation and report on the ability of the Wittemann-Lewis Aircraft Co. to produce machines according to Government specifications. We understand that his report was a favorable report, and that he recommended that this company be given a contract. This proves the Aircraft Production Board's belief in our ability. No action was ever taken by the Aircraft Production Board subsequent to Lieut. Ridlon's report.

As further proof that the Aircraft Production Board believed we were large enough and had an efficient organization we submit the following evidence of record between our company, the Curtiss Aeroplane & Motor Corporation, and Senator Frelinghuysen. This shows a contract was offered us by the Aircraft Production Board, which we could not consistently accept because of the stand of the Curtiss Aeroplane & Motor Corporation. This took place before Slocum, Avram, and Slocum were made production managers:

BUFFALO, September 20, 1917.

WITTEMAN-LEWIS AIRCRAFT CO.,
Newark, N. J.

DEAR SIR: This is to advise you that the blue prints and specifications covering the parts for the JN4 machines which you intend to manufacture, have been completed and are ready for delivery to you.

We inclose herewith form of agreement, in duplicate, which we would ask that you execute, returning both copies to us, together with your check for \$500 as provided in the said agreement.

Upon receipt of this agreement, duly executed by you, together with the check, we will execute and return one copy of the agreement for your files and deliver to your representative the blue prints and specifications hereinbefore mentioned so that he may check same and give us a receipt therefor.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, Secretary and Treasurer.

This agreement, made this day of September, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the Wittemann-Lewis Aircraft Co., a corporation of the State of New Jersey, having its principal office in the city of Newark, party of the second part.

In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, and designed and built by the party of the first part.

The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part one per cent of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs and upon which the said party of the first part hold good and valid patents, and also to pay to the party of the first part the sum of two hundred dollars for each and every aeroplane known as the military tractor so manufactured, all such payments to be made to the party of the first part not later than the tenth day of each month for all aeroplanes or parts thereof manufactured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of five hundred dollars in payment of one per cent charge on the first fifty thousand dollars of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of five hundred dollars shall remain the property of the party of the first part, even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of fifty thousand dollars.

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used by any persons other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specifications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective seals to be hereunto affixed the day and year first above.

CURTISS AEROPLANE Co.,
By _____,
Secretary and Treasurer.
WITTEMAN-LEWIS AIRCRAFT Co.
By _____.

BUFFALO, November 6, 1917.

The WITTEMAN-LEWIS AIRCRAFT Co.,
Newark, N. J.

DEAR SIR: Replying to your letter of October 30: In regard to the first change you desire in the agreement we sent you, I do not think it advisable to make the change suggested by you, as the fee mentioned in the third paragraph on the first page of the agreement applies only to our aeroplane model known as the Jn military tractor and does not cover any machines that may be manufactured according to your own designs.

In regard to the second change which you desire in place of the fourth paragraph on page 1 of the agreement, where we ask a deposit of \$500, we feel that this request is only fair to cover the expense of furnishing a set of drawings and changes which may occur from time to time, this deposit to be credited against the 1 per cent license fee as it accrues, and a further payment to be made when the accruals exceed \$500. We do not feel that under the circumstances we should be asked to furnish information pending your receipt of order from the Government without such payment, and believe that in furnishing this information we are helping you to obtain such an order, and we should be reimbursed accordingly.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY,
Secretary and Treasurer.

MARCH 6, 1918.

Hon. J. S. FRELINGHUYSEN,
United States Senate.

DEAR SIR: This is in reply to your communication of the 28th asking us to furnish you with information with reference to Col. Horner's statement that we had been offered a contract for 300 spares, etc.

About September 1, 1917, Mr. S. D. Waldon (now Col. Waldon) offered to permit us to submit figures on spare parts to be manufactured from designs of the Curtiss Aeroplane Co., and instructed Mr. Hutchison Scott, who was then second vice-president of our company, to call on Maj. P. L. Shepler in Buffalo, stating that he would instruct Maj. Shepler to give us an order for the 300 parts. Lieut. Farwell then stated that the order would be ready the following day, whereupon Mr. Scott summoned our Mr. C. R. Wittemann to Washington. Lieut. Farwell gave them a list of parts with a sealed letter to Maj. Shepler and instructed them to go to the Curtiss factory. On arrival at that factory at Buffalo, they were refused the blue prints, but Maj. Shepler said he would take the matter up with the Curtiss officials. Finally, Messrs. Wittemann and Scott were taken to the office of Mr. B. A. Guy, the secretary and treasurer of the Curtiss Co., who stated that we would have to enter into an agreement with the Curtiss Co. and that the form of agreement would be forwarded for execution in about 10 days' time.

On September 20 the Curtiss Co. sent us a letter and form of contract (copies inclosed). From this you will notice that in order to manufacture the parts it would be necessary for us to pay to the Curtiss Co. 1 per cent of the selling price of the parts plus the sum of \$200 on each plane. Likewise, that we pay them the sum of \$500 in advance, being 1 per cent on a possible order of \$50,000.

We sought the advice of our counsel, Mr. Loren N. Wood, who suggested that under the circumstances he thought the Curtiss Co. would be willing to modify the agreement, at least in two particulars, and we thereafter wrote the Curtiss Co. a letter dated October 30, a copy of which is inclosed. To that we have received a reply dated November 6 (copy inclosed). We did not feel that, in order to bid upon Government work we should be compelled to pay the Curtiss Co. \$500 in advance, although we were quite willing to pay for the expense in having the necessary blue prints made upon which our bid was to be based.

On February 28, at our request, we were granted an interview with Col. Horner, at which time he referred to an interview he had had with you and asked why we had not accepted an order for 300 spare parts. He was then informed of the agreement which the Curtiss Co. required and especially of the causes to which we have above referred. He was also advised of our plant, organization, and that we had been in business for 12 years, during which period we have built approximately 300 aeroplanes for some of the best known aviators and which have been flown all over this country as well as in foreign countries. He was also advised of the report made by Messrs. Slocum, Avram & Slocum submitted on December 2, 1917, a copy of which we are sending you under separate cover. Col. Horner stated that he did not know of these facts nor of the report.

We are able to contract for and deliver 600 machines in the first 12 months and 100 machines per month thereafter. We believe that we are in an exceptional position, with an established plant, equipment, and an organization of experienced men. We are desirous of serving our country in the manufacture and production of aeroplanes and we can not understand why we, who are one of the oldest manufacturers of aircraft in this country, have not been given an opportunity.

Respectfully, yours,

WITTEMAN-LEWIS AIRCRAFT CO. (INC.),
By C. R. WITTEMAN, *President.*

There is a long record covering a period of over two years which proves conclusively that Government aircraft authorities believed thoroughly in our competency to manufacture aeroplanes. Its recital here would only accentuate the Government's policy of promise and nonperformance so far as we were concerned.

From its beginning our company has been engaged exclusively and continuously in the manufacture of progressive aircraft and its accessories. It has a record of 300 complete machines. Every machine manufactured has been flown successfully.

There has never been a fatal accident or death due to the use of these machines.

Our present plant at Newark, N. J., contains 12 000 square feet of floor space. It is fully equipped with all necessary machinery. We can turn out now one complete machine of our type, or one of similar proportions according to Aircraft Production Board specifications, each week. We could put into use immediately available addi-

tional floor space on these premises that would increase this production 100 to 200 per cent.

Should the emergency demand, we are in a position to commence immediately the erection of our large factories on our recently acquired property with an approach to the Hackensack River. This location was selected by a board of engineers as the best site in the Greater New York for an aeroplane manufacturing establishment, flying field, waterway for demonstrating flying boats, and as a possible Government aircraft base.

It would not require over 10 weeks to erect the first units of our plant. At that time the first machinery would be installed and would be ready for operation.

As I stated to you, our plan of production will be under the combined forces of Slocum, Avram & Slocum (Inc.), and the Wittemann-Lewis Aircraft Co. The guiding mind of the entire production program will be Mr. Mois H. Avram, president and chief engineer, Slocum, Avram & Slocum (Inc.), New York, and Newark, N. J. Mr. Avram is now superintending the production of several millions of dollars of the most intricate and difficult material for the Procurement Division, Artillery Section, Ordnance Department, United States Army. He is a member of the American Society of Mechanical Engineers, the American Society for the Advancement of Science, the Aeronautical Society of America, the Society for the Promotion of Engineering Education, and is a lecturer on industrial engineering at New York University.

He is the organizer of the campaign to raise \$4,500,000 for New York University.

He is chairman of the New York University engineering fund committee, of which Mr. Finley J. Shepard, Mr. Howard C. Seaman (treasurer of the E. W. Bliss Co.), Prof. Collins P. Bliss, and Dean Charles H. Snow, are members.

He is the organizer of the endowment plan which has been adopted by the New York University in connection with its school of applied science. The basic thought in this plan is to develop the engineering capacity of America to meet the unusual requirements of such conditions as are involved in the problems of the world's war, and is certain to have a tremendous influence in helping this Nation to win the world's war.

Mr. Avram's attainments are of such high order that the Ordnance Department, United States Army, upon learning of them, gave his corporation, Slocum, Avram & Slocum, contracts to the extent of several millions of dollars for the manufacture of gun sights, range finders, and other difficult and intricate ordnance matériel which the Government required quickly.

Mr. Avram is a production director who works along scientific lines, with a practical working vision to always anticipate mechanical manufacturing requirements and to have the men and the machinery on hand to meet these requirements at the moment they are needed.

Our location gives us the benefit of the greatest labor market in the world. Mr. Avram's qualities of production leadership are based in part upon his remarkable ability to seek and find the highest type of mechanical engineers, and expert and thoroughly efficient machinists, and no man knows this particular market better than he does. His human sympathy, tact, and practical attainments in directing men enables him to establish an esprit de corps throughout an organization which is a prime necessity in these days to facilitate patriotic production.

Under Mr. Avram's direction, our establishment, when completed as stated above, will give us a capacity of four machines every day by the seventh month of operation, making the first delivery toward the end of the fourth month. This production can be increased to 20,000 machines of the scout machine type or similar proportions, within a period of 12 months after our production has reached four machines a day.

It takes longer and it is more difficult to create a strong and proper production organization than to build a large plant. Now if it is a question of speed in order to win the war, which one of the two should our country choose, to use the existing organization or the existing plants without organization?

Inclosed herewith find copy of letter dated May 2, 1918, written by Mr. Avram to the New York Times, which contained many valuable suggestions to the Government regarding the proper manner in which to handle the aircraft situation for the purpose of quick and efficient production, and by this to help win the war. Since this letter was written, the Aircraft Production Board has incorporated many of the suggestions set forth, and is on the way to adopt others.

That letter is but one of Mr. Avram's timely contributions to aid in winning the war, which is always his dominant thought.

When the President and Congress organized the Aircraft Board and gave it \$1,000,000,000 to carry out its program, the basic thought was to make aircraft to win the war quickly. That was the patriotic duty of that board to America and to the world.

There was no thought to subsidize or protect financial interests involved in the automobile, piano, or other similar industries from loss by the natural operation of the world war.

The statement of Capt. Clarke, plant facilities division, Aircraft Production Board, was made to Mr. Avram and myself July 10, 1918, that the output of the automobile industry had been reduced by the Government authorities to 20 per cent and would in all probability be completely wiped out in 60 days; that therefore, in view of this calamity, he believed it would be the policy of the Aircraft Production Board to adjust its placing of all orders for construction so as to meet this deficiency and thus protect the automobile industry.

The statement made by Mr. W. C. Potter, April 20, 1918, to the Wittemann brothers, that the placing of orders to manufacture aeroplanes by the Aircraft Production Board would have to take into consideration the requirements of the piano industry, shows the same line of thought.

We know that you will agree with us that the intent and purpose of the President and Congress, and we believe it is your intent and purpose, was to manufacture aeroplanes quickly and thus put forward all the power of this Nation to win the war at the earliest day. We know it was not their intent and purpose to protect from loss and bankruptcy any interest or industry, and we do not believe it is yours.

Any other policy than this would wreck the chances of America and our allies in our God-given task of winning the world's war. Any other policy would aid His Imperial Majesty, William the Hun, the unspeakable, heir presumptive to the throne of hell.

Yours, very respectfully,

WITTEMANN-LEWIS AIRCRAFT CO.,
By REDMOND F. KERNAN,
Secretary and Sales Manager.

COPY OF LETTER WRITTEN TO NEW YORK TIMES MAY 2, 1918, BY MR. MOIS H. AVRAM.

MAY 2, 1918.

After so much has been said that is not at all favorable to the Aircraft Production Board, one would expect that the silence of the members of such a board presages a good omen, that a surprise is in store for this patient and liberal Nation.

The two Senate committee reports, and the Marshall committee's report, however, are all in agreement that a revolutionary reorganization of this vital branch of the Government's war program is necessary if it is to be a success and with the Germans hammering away toward the North Sea, there must be, there will be, no "if."

Of course, "first-aid" legislation was sure to be introduced in the two Houses and as soon as some of these bills become law our President can set the reform machinery in action. We have indeed read the most bombastic forms of criticisms of those accused of failing in the air program, but no direct or carefully balanced criticism has yet come from the industrial engineer. He is the one person who, realizing the task of accomplishing vast engineering feats, is not so quick or ready to advance theories unless they are the vanguard of preconceived plans resulting from an investigation or previous experience.

Politicians and critics of the administration have had a deal to say about this engineering problem, but the affair is altogether too serious for us, as a Nation, to be satisfied with balanced phrases. Engineering success is dependent on the efficient assembling of scientific truths which have done duty, over and over again, in "overalls."

In planning so vast a problem as the aircraft must have proved to be, "the truths which have done duty" may not have been either selected as a premise to work from or if they were, they might not have been used rightly. This is due in a large measure because we as a Nation have been apathetic for years to the subject, took no practical part in aircraft until war darkened the earth, and perhaps we have a guilty conscience in the matter so that those who have been assigned to this task, so filled with thrilling responsibilities, have for the moment forgotten that, in dealing with so large and urgent a demand for airplanes, they were just lifting a child from its cradle whose treatment for its proper development was not that accorded to a child but that to a full-grown adult. The airplane enterprise of the United States prior to our entering the war was, as yet it seems to be, as this undeveloped child. The allies alone possessed the adult which we seem to have neglected as a measure of precaution and quick action.

Enough has been said regarding what would have been best for the Aircraft Board to have done. It should have selected the best allied plane and motor and built these in quantities in this country. It is all true but constantly hammering on the point without suggesting something constructive as a plan around which the air

program can be quickly rebuilt, will do nothing but further embarrass the Administration.

We have also read so often in our newspapers that separating the Aircraft Board from the Signal Corps or creating a minister or secretary of aircraft responsible to the President would immediately cure the situation. All these suggestions point out one single thing—that the aircraft problem stands quite by itself and it calls for the most simple and reasonable form of operation rather than a web of many ramifications where it is hardly possible to understand or find who has really the final word. It has been shown by experience that in the mess of the aircraft operation at Washington it usually takes one a few days to find out whom he is to see regarding a particular question; when he finally discovers his place it takes a few days more to get an interview, only to meet a youngster perhaps who has been given the responsibility to place large orders and decree the fate of many anxious airplane men. If an attempt is made to reach the men presumed to be atop, it is again found that they are many, and if any is reached, it may not take long to face the “youngster” again with the same result.

If a private enterprise were placed in the same position, two things would happen:

(1) There would be a single head to whom dissatisfied claimants could come freely as a last resort and from whom fair treatment of the question could be obtained.

(2) This head would employ competent men to take charge of respective departments who would be fired if they lacked concern for the success of their departments.

The success of the business demands such a procedure. If responsibility in the operation of an enterprise of any type were not left to the judgment of one single head, it would be almost impossible to place the guilt in case of mismanagement. Therefore, concentrating the powers now distributed among many in connection with the aircraft program in the hands of one single man delegated to reorganize what we now possess in the shape of aircraft material, or even to start anew to plan for a program that will supply us with machines of all types as soon as is consistent with the needs of our Army.

Two of the chief requisites in the production of war material are—

(1) The country's ability to concentrate large amounts of material so that it can be obtained and operated upon quickly.

(2) Concentrated brain power, so that the findings and experience of a set of men can be used for uniform production at one point as much as possible, for in the art of aircraft, which has not yet passed into the realm of science, it is almost impossible to conceive that, let us say, 100 manufacturers of automobiles or pianos, or men merely possessing nerve, could organize and produce the required airplanes. The aircraft brain power did not and does not exist in many of the airplane companies that have been organized for this very special field of industry.

For this very reason this minister of aircraft or all-intrusted head, or, better still, “director general” (as proper an appellation as that of Mr. Schwab's with the Emergency Fleet Corporation), should have vested in him the authority to organize, equip, and construct an aircraft arsenal, or a number of such arsenals, which should concern themselves with and be responsible for the production of airplanes of the best standard types now actually in use at the various war fronts, and also for the production of the best types of motors of proved success used abroad and here, or, better still, in order to give such a large production plant the proper and a greater impetus, strengthen it with the incentive usually existing when private interests operate such a plant, which should have the same form of organization as proposed for the Government arsenal.

As a part of this aircraft arsenal there might be a large experimental laboratory to develop American engines and planes, and where the ideas of all inventors may be weighed and appraised and not only a verdict rendered on their merits but also developed most diligently, and while it is my personal belief that as a rule an invention is more successfully developed by private interests, I believe that an experimental laboratory should be part of the aircraft arsenal, purely as a war measure, so that carefully selected boards can make studies of such inventions, and being equipped with thorough data and facts on which to base comparisons, these experts will be able to make quick tests and carry them out into being either with or without an inventor's assistance.

Of course, the present board should complete as much of its program as it can and the unexpended balance should be turned over to the new head who will also be protected against a repetition of the board's errors by being in possession of its complete records. If the present board should become short of funds to carry out its program the entire work in progress should be transferred to the appointed “Director General” whose powers should extend so as to permit him to bring into his plan of organization only such men of the present board as he would need or consider competent, permitting many to serve with other departments more suited to their worth and ability, while others would serve in the Regular Army.

For many months, now we have been expecting an airplane miracle from automobile methods and experience. The mathematics of the air are as yet a little uncertain, still are in need of a Euclid. It was natural enough that the Aircraft Board should align its administration with men identified with the automobile industry, for none other contains so many of acknowledged ability, but these men are not magicians. The output of automobile concerns under the leadership of known production engineers is not the work of a day, nor a year. We look upon these mammoth plants running day and night, with amazement, not considering that these are the results of 10 or 15 years planning and developing.

Nor should aircraft engineering be confused with automobile engineering. The principle involved in quantity production is not the same, for while automobile engineering is dependent on the exact science of engineering, the mathematics of aircraft engineering are most incomplete, nor have they yet been properly applied to the production of airplanes. Aircraft engineers have become such through years of hard experiment, and their usefulness in connection with aircraft production can come only through actual knowledge of aircraft.

Neither automobile production engineers nor aircraft engineers alone can be expected to put through the requisite quantity production of airplanes. One is needed to provide quantity production—the other to see that the production is right.

Irrespective of what seems to have been a grave oversight in not associating aircraft and production engineers to a greater extent than was done, what perhaps contributed to retarding production was the spreading of the airplane contracts all over the country. To my mind it is quite as important to merge all the airplane factories as it is to merge the control of airplane production in one head, whose powers as already indicated shall be impregnable, for the principal reason that such centered authority can only become efficient without interference, as the inefficiency of a single head can more quickly be noted and consequent change rapidly made than would be the case if a body of men—no matter how able they separately may be—were to jointly head an enterprise, for it is difficult to place responsibility on any but a single individual.

Ordinary private enterprises to-day, many of which due to the war became very large ordnance corporations, are guided by the hand of one man whose vision is not obstructed by the bigness of the job. Behind this man is the "organized brain power" of perhaps a few men, about whom a vast organization can easily be built. It is the organization power back of the mills that keeps them running, and not the extent of plant or equipment.

The whole situation, sensed a little more clearly from newspaper fragments of the two Senate reports, indicates a pressing necessity for an aircraft arsenal which shall house the joint efforts of the production and the aircraft engineers under the forceful guidance of the "director general." With such an arsenal under proper direction, the chances of producing large quantities of airplanes of one type would be greatly increased. An aircraft arsenal need be nothing more nor less than an enlarged reproduction of a smaller plant (with the addition of a laboratory as mentioned above). Where an airplane plant turning out 500 machines calls for 30 distinct departments, a sufficient area properly located might be provided for the aircraft arsenal to accommodate 30 buildings, under the roof of each, a certain part or parts to be made as previously assigned to it. A large building for assembling the machines would be necessary, of course.

One of the weak tendencies of the Aircraft Board, in my opinion, was in its adherence to the theory that it is cheaper and quicker to take over various buildings, provided only they are large enough—buildings originally planned for quite a different object and try to accommodate them to aircraft production. It is more efficient, and certainly less difficult to plan out special buildings than it is to fit airplane construction to wrong buildings. This is being proved all the time, as old buildings which should long ago have been turning out planes have been until recently in a process of alteration.

Such a national aircraft arsenal should draw together the best production engineers—many of whom are not now in the Government service—and out of the 50 aircraft engineers it is claimed we have in this country, five of the very best be appointed assistants to the director general and those departments requiring it, put under the direction of a production of an aircraft engineer, or both, subject to duties outlined in advance.

In my opinion, this would guarantee the production of reliable planes in sufficient quantities to help win the war. It is obvious that concentrated effort has greater advantages than effort distributed all over the map; especially does it hold true in connection with those types of airplanes needed to win the war—nor do my remarks apply to other types if the Aircraft Board has made considerable advance with them. This same deduction, as to concentrating production, applies to the production of airplanes much more readily than to ordnance.

When dealing with metal production one has something definite to work with, but it is hardly so with materials used in the production of airplanes. Irrespective of this, even in ordnance, everyone can see and understand why such large ordnance private corporations as the Bethlehem, E. W. Bliss Co., and others have made so great a success—the reasons being that each one had its “director general.”

It is neither impossible nor very difficult to establish such arsenals, out of which twelve, twenty, or even twenty-five thousand planes could be turned out, for unlike shipbuilding wharfage, space and docking facilities are not necessary. The actual manufacture of a plane presents no difficulties, but it is essential that the aircraft minister be guided by a working plan, fully laid out, and which can be deviated from only in the smaller details.

The plan of concentrating such a large output might be criticized by some who believe that the division of a large production order into small units throughout the country might prevent the repetition of mechanical errors. The time for discussing this is past, as is shown by the breakdown of the Aircraft Production Board which operated under such a prejudice.

In any event a wholesale “speeding-up” of the Nation’s aircraft program is urgently needed and planes, equipped with motors must be turned out by the thousands in place of the endless stream of changing plans and specifications that have been circulating back and forth among the various bureaus of the Signal Corps headquarters. But then the management of the whole board has perhaps erred in the direction of discretion. Valor is needed for the mastery of the air and ’tis youth that wants to climb, higher still and higher. The blue sky, forever young, confounds the doubts of age, and when the air produces its Napoleon, he will be no graybeard, but a flashing-eyed youth. I am not pleading for any amateur performance or program, but trying to indicate the direction where speed is. Conservatism drops automatically with flights from the earth.

The ideals which the Aircraft Board was so concerned about have brought upon its head the criticism that it was concerned only with “tinkering” and that its directors were “swivel-chair” theorists. This is unfortunate. This “tinkering” must continue, but not by the Production Board, for as the “Science of Aeronautics is in a state of constant and rapid development,” the British cabinet says, “Improvements in engines and planes are being constantly worked out.”

For this reason we must all rise to the need of preparation by calling for all our technical schools to get ready for a complete course in aircraft engineering. As a lecturer in industrial engineering in the schools of applied science of New York University, I hope it will see the light in this matter. I believe it is up to the various societies of aeronautics to set to work to form a committee of the foremost aircraft engineers who can cooperate and collaborate with teachers of engineering, the object being to work out a complete, carefully planned course of aircraft engineering, which should be offered free to all engineering schools.

We must work on the premise that airplane production will be one of the great industries of the future, both for pleasure flying and as a common carrier, as well as the great means of our country’s defense. We must therefore not delay to create the facilities needed for the proper development of aircraft.

It is important to bear in mind that whatever the delay in delivering airplanes, the tasks of our present administration are stupendous and can not be compared with any other phase of earthly problems requiring such a change in the governmental organization. Those who stay at home and read the newspapers must realize very quickly that a 12-month period is indeed small to expect to accomplish in it what has so far been done. If the Aircraft Board has failed to do all it promised there are other departments of the Government that have done better than expected. A spirited reorganization and persistent action will rapidly raise the aircraft to the level of all expectations and the greatness of its results may yet exalt us in admiration of its work at the front.

Yours, very truly,

M. H. AVRAM.

AIRCRAFT PRODUCTION.

FRIDAY, JULY 19, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met pursuant to adjournment at 2.30 o'clock p. m., in the committee room, Capitol Building, Senator Thomas (chairman) presiding.

STATEMENT OF MR. MOIS H. AVRAM.

The CHAIRMAN. Mr. Avram, where do you live?

Mr. AVRAM. New York City, at 66 Fort Washington Avenue.

The CHAIRMAN. What is your business?

Mr. AVRAM. Industrial production engineer.

The CHAIRMAN. How long have you followed that occupation?

Mr. AVRAM. Over 10 years. I have been a lecturer on industrial engineering at the New York University.

The CHAIRMAN. Are you acquainted with the Wittemann-Lewis Aircraft Co.?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. They are located in Newark, N. J.?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. How long have you known of that enterprise?

Mr. AVRAM. I have known them since the beginning of 1917.

The CHAIRMAN. What is the business of that corporation?

Mr. AVRAM. Aircraft production and the manufacture of airplanes.

The CHAIRMAN. Have you any personal knowledge as to how long it had been in that business before you became acquainted with it?

Mr. AVRAM. That is really covered by my report. As I understand it, they were in business over 12 years there. They have never been in any other business.

The CHAIRMAN. If I understand you, this corporation was engaged in the manufacture of aircraft for 12 years prior to the declaration of war by this country against Germany?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. About 12 years.

Mr. AVRAM. Yes, sir.

The CHAIRMAN. Where are their factories located; that is, in what city and what State?

Mr. AVRAM. Newark, N. J., on the Lincoln Highway.

The CHAIRMAN. Have you any personal knowledge of any efforts or negotiations between the company and the Aviation Production Board or other representatives of the aviation program in Washington?

Mr. AVRAM. The efforts were constant without any cessation at all.

The CHAIRMAN. About when did they begin? When I ask these questions I want you to understand, of course, that I do not expect the act date in all cases.

Mr. AVRAM. They began, I think, immediately after war was declared.

The CHAIRMAN. That was immediately after the 6th of April, 1917?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. What did you have to do with those negotiations?

Mr. AVRAM. We were called in.

The CHAIRMAN. When you say "we," you mean the firm?

Mr. AVRAM. I represent my firm, Slocum, Avram & Slocum (Inc.), industrial engineers, our business being to investigate and report to financial men on production and otherwise. We do that right along. We were called in in connection with Wittemann and Lewis, and we made an elaborate report for the Production Board after they had failed to get anywhere with the Aircraft Production Board.

The CHAIRMAN. That report is a very elaborate one, is it not?

Mr. AVRAM. Quite so; and we stand on it.

The CHAIRMAN. It covers all the history and potential conditions and capacity for production, etc., of this company?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. Was a copy of that report given to the public authorities here?

Mr. AVRAM. It was submitted. I submitted it to Mr. Deeds personally, in December.

The CHAIRMAN. Do you mean Mr. E. A. Deeds, afterwards Col. Deeds?

Mr. AVRAM. At that time the head of the Aircraft Production Board.

The CHAIRMAN. You submitted it, when?

Mr. AVRAM. December 6, 1917. I would like permission to explain.

The CHAIRMAN. Yes; go ahead.

Mr. AVRAM. When we prepared this report it was understood that we did not come in any investigation of that sort where we have to help to get the contracts; that is not our business, but Wittemann-Lewis could not deliver it to any officials of importance.

The CHAIRMAN. Why?

Mr. AVRAM. They could not get interviews. I smiled. I knew that it should not be difficult to get interviews with anybody on the question of preparation for war. I offered my services. I offered to deliver it myself and it took me three days to deliver it, and the only way I could deliver it was to wait in the hall until I thought I recognized Mr. Deeds. I took a chance. I delivered the report into his hands. He said, "I will look into this and deliver it to Mr. Shepler." That is all I could do. I did not do any more. I wanted to deliver the report that they could not deliver.

The CHAIRMAN. You say you were here for a period of three days which was spent in an effort to deliver to some properly constituted authority this report?

Mr. AVRAM. I only wanted to deliver it to Mr. Deeds.

The CHAIRMAN. What effort, during those three days, did you make to have a conference or a meeting with Mr. Deeds?

Mr. AVRAM. The only man I could see or could reach was his secretary, a young Lieut. Harvey. I am not sure of his name. I think that is right. He insisted that I could not see Mr. Deeds. He said he had conferences. There was conference after conference. He said that he would leave that particular day or that he was in a meeting. While I do not want to say that that was not so, the fact remains that I could not see him for that length of time. I met him the way I explained before.

The CHAIRMAN. You tried to see him on each of those three days?

Mr. AVRAM. Yes, sir. I had nothing else to do. I came to deliver that report.

The CHAIRMAN. How long before had that report been completed?

Mr. AVRAM. How long did it take to prepare it?

The CHAIRMAN. No. You had completed the report before the 6th of December. When did you finish that report?

Mr. AVRAM. We finished on December 1.

The CHAIRMAN. It was delivered to Mr. Deeds five days afterwards?

Mr. AVRAM. Five or six days afterwards; yes, sir.

The CHAIRMAN. Did you have anything to do with efforts made previous to the delivery of that report on behalf of this corporation to secure work?

Mr. AVRAM. No.

The CHAIRMAN. You did not?

Mr. AVRAM. No.

The CHAIRMAN. Subsequent to that time, did you?

Mr. AVRAM. I interviewed Lieut. Farwell. He was assistant to Mr. Shepler.

The CHAIRMAN. Where was Shepler's office?

Mr. AVRAM. At 119 D Street.

The CHAIRMAN. Now, tell as briefly as you can what took place between you and Lieut. Farwell.

Mr. AVRAM. Lieut. Farwell, the minute I mentioned the name Wittemann, said, "That is a lemon."

The CHAIRMAN. That was his reply?

Mr. AVRAM. Yes, sir. I looked at him in disgust and disappointment, because an ordinary business man would not do that. I asked him why he thought so. Then I explained to him that we had not known much about Wittemann for very long, but that we had gone into it exhaustively. I said that with what they have and what is planned for them to have they have more than any concern that had nothing and was not in the aircraft business before.

The CHAIRMAN. About what date was that?

Mr. AVRAM. It was December 19.

The CHAIRMAN. This was after you delivered the report?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. My question had reference to what, if anything, had occurred, of which you had knowledge before that report. Did you see any of the people before that?

Mr. AVRAM. No, sir.

The CHAIRMAN. Then this interview with Lieut. Farwell, in which he characterized this enterprise as a "lemon," took place in the middle of December after you had delivered to Deeds a copy of that report?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. Now proceed.

Mr. AVRAM. I started to analyze briefly the whole situation of the Wittemann-Lewis affair, arguing along the lines of the report, and I finally succeeded in getting from him a promise that he would send an inspector to the plant. Inspector Ridlon arrived at the plant on December 22, and remained two days in New York.

The CHAIRMAN. In New York?

Mr. AVRAM. In New York and Newark.

He went into it thoroughly and interviewed the people. He asked us to investigate Wittemann and Lewis, the people whom it was proposed to finance, and looked over their plant at Newark, and went to the new property at Hasbrook Heights, the flying field which the Wittemann-Lewis Company arranged for and purchased with a view to developing a large plant over there. As far as I am concerned personally, I never have heard anything as to what became of the report. Nothing came of it. Lieutenant Ridlon evidently submitted the report.

The CHAIRMAN. Did he give you a copy of it?

Mr. AVRAM. No, sir.

The CHAIRMAN. Did he tell you what it would contain?

Mr. AVRAM. Before he left he indicated that he was fully satisfied as to the situation, but we did not know the contents of the report.

The CHAIRMAN. Who were the people in New York to whom Lieut. Ridlon was referred as willing to finance the Wittemann-Lewis Co.?

Mr. AVRAM. I have not asked permission to mention the name. Is it necessary for me to answer? Personally, I have no objection. I would have been glad to answer the question if I had known it was going to come up and could have been prepared. I did not know it would come up. I know that I would have received permission to give that information. It is one man and his associate.

The CHAIRMAN. One of the representatives of the company is in the room, and I imagine that it is for him to say whether you shall tell.

Mr. AVRAM. The men interested financially, or who were at that time to become interested financially——

The CHAIRMAN. I am asking about now.

Mr. AVRAM. He is an outsider. I do not think Mr. Wittemann would tell. I think he would be in the same position.

The CHAIRMAN. Well, whoever it was, did the lieutenant express to you any opinion regarding his financial ability and the intention to finance this enterprise?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. He did?

Mr. AVRAM. Yes. If I were to mention his name, you would be able to tell that he is able to do it.

The CHAIRMAN. I do not want you to betray any professional confidences, or what you think should be so construed.

Mr. AVRAM. I can write the name, if you wish it, the minute I get to New York.

The CHAIRMAN. You say that you have never seen a copy of that report?

Mr. AVRAM. No.

The CHAIRMAN. Did you have any further conferences down here with any of the production authorities.?

Mr. AVRAM. I recall one. That was the last of my working connection with them. That was Mr. Lowry, representative of Wittemann-Lewis, and Lieut. Farwell, in Shepler's office.

The CHAIRMAN. What was the date?

Mr. AVRAM. January 18.

The CHAIRMAN. Of this year?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. What occurred?

Mr. AVRAM. I recall that Lieut. Farwell stated that the report was satisfactory and that an order should be forthcoming.

The CHAIRMAN. Was that stated in the presence of—

Mr. AVRAM (interposing). Col. Shepler and Mr. Lowry.

The CHAIRMAN. That then, terminates your identification with this question?

Mr. AVRAM. Yes; at that time.

The CHAIRMAN. After which time you have not been directly connected with it?

Mr. AVRAM. No.

The CHAIRMAN. You have not been connected with their efforts to secure work?

Mr. AVRAM. Except that we remained thereafter as their production engineers, in connection with plant development and quantity production for them, but not anything regarding knowledge of aircraft, because that is not our business. That is their business.

The CHAIRMAN. I understand that.

Mr. AVRAM. We felt right along and we advised the bankers that a combination of production engineers and men who knew aircraft would give results.

The CHAIRMAN. You were employed, if I understand the situation, by the Wittemann-Lewis Co. in your capacity as industrial engineer to make a report regarding all phases of the company's business and their capacity for production for the satisfaction of the Government, and also for the satisfaction of those who might be called upon to finance it for them.

Mr. AVRAM. Yes, sir.

The CHAIRMAN. And your report was delivered in both directions?

Mr. AVRAM. We made a favorable report to the financial men.

The CHAIRMAN. How long a time did you spend in making that report and in making your investigations, etc.?

Mr. AVRAM. I think we spent two months. We employed a number of engineers in various lines. We have a large staff of engineers.

The CHAIRMAN. With this end in view?

Mr. AVRAM. Yes, sir. You might ask some bankers in New York as to our engineering ability to handle production.

The CHAIRMAN. No. Your capacity is presumed until somebody else questions it.

(N. B.—Mr. Wittemann's testimony follows:)

WITTEMAN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., July 31, 1918.

HON. C. S. THOMAS,

Chairman Subcommittee Military Affairs Committee,

United States Senate, Washington, D. C.

HONORABLE SIR: I am herewith inclosing a copy, corrected, with the insertions of the various letters and memorandums requested for your records.

Also a copy of conferences, etc., in which Mr. Hutchinson Scott, at that time second vice president of this company, took prominent part, particularly to an informal

inspection of our machine at Mineola with the various dates in the left-hand column.

I believe that the contents of this will be interesting data to include in my testimony, particularly since this same Capt. Martin, now Maj. Martin, has again taken it upon himself to contradict Lieut. W. W. King's report on our later model, recently.

Thanking you for your many courtesies, in this matter, I am,

Respectfully, yours,

PAUL W. WITTEMAN.

(Outline written by Mr. Hutchinson Scott. Submitted as part of the testimony of Paul W. Wittemann.)

In reference to the Wittemann-Lewis military tractor biplane:

Messrs. Charles R. Wittemann, S. C. Lewis, and Hutchinson Scott proceeded to Washington with the idea of ascertaining why the Wittemann-Lewis Aircraft Co. had not been given a contract for aeroplanes, the Wittemanns being the oldest aircraft builders in the country. They had filed their proposal for machines under the proper schedules and the bid was regular in every respect and put in by a company actually engaged in such manufacture, contracts having been awarded all other bidders of good standing except the Wittemann Co.

Col. Thomas Cruse, now Gen. Cruse, had the kindness to escort these gentlemen to the aeronautical division of the Army and personally introduced them to Maj. Mitchell, Col., now Gen. Squires being absent. After a short conversation Maj. Mitchell informed these gentlemen that as fast as they could build and deliver machines of the training type at the station at Mineola they would be accepted and paid for, if they came anywhere near the specifications or could meet the requirements incident to such service. Owing to work on hand it became necessary for the Wittemann Co. to have additional quarters, and they consequently leased a building in Newark, N. J., and as soon as the necessary machinery could be installed began and completed a training type Army biplane.

This machine when completed was delayed for a period of six weeks owing to the fact that all good aviators had joined the Army and the services could not be secured. Where they were at leisure the weather was so inclement that flight was impossible.

The machine was, after one short flight, flown directly from the factory to Mineola. The aviator was Mr. Allan Adams, United States civilian instructor at Mineola, who has the American reputation of being the best there is in the United States or in Canada.

Mr. Adams was to make a trial flight, but finding the machine to be so perfect he did not return to the factory, but continued his flight and landed on Governors Island, where he closely inspected the English Vickin machine at that place. The flight to Mineola was then resumed and he was so pleased with the machine he took quite an extended tour, testing out its stability and ability thoroughly; the wind during portion of the flight was southwest, puffy, and blowing from 25 to 35 miles per hour.

The machine was landed on the field at the United States Army aviation station at Mineola Sunday. The commanding officer of that station on Monday issued orders that no machine except Government machines be allowed to land on that station.

On the request of Mr. Scott to test the machine in any manner deemed best, the commanding officer declined unless he received positive instructions from Washington to do so. Mr. Scott and Mr. Wittemann proceeded to Washington and had an interview with Col. Saltzman who stated they wanted all the good machines they could obtain but it would be proper to take the matter up with Col. Bennett's department as such matters came directly under his charge. They proceeded to the Mills Building and as Col. Bennett and assistant were at that time in Canada, they were referred to Capt. Harms. Capt. Harms appeared to be a young gentleman who had just taken up aeronautics and had a superficial knowledge of the subject. After quite a discussion on the subject, he stated he would instruct the commanding officer at Mineola to test the machine. A few days after this Mr. C. R. Wittemann and Mr. Scott saw the commanding officer, Capt. Kilner, who stated that he had not received the proper authority. A week elapsed and no test being made, Mr. Wittemann and Mr. Scott were informed by employees of the station that the machine had been most carefully scrutinized, photographed and inspected by the officers and the Curtiss expert. As no authority or test had been made after expiration of two weeks, Messrs. Wittemann and Scott proceeded to Washington to ascertain the difficulty.

They proceeded to the Mills Building, and called on Col. Bennett who had just left for the Munsey Building. They proceeded to the Munsey Building and Mr. Scott saw Col. Bennett and outlined the situation as clearly as possible. Col. Bennett informed Mr. Scott that Mineola was no longer an experimental or test station. When Mr. Scott asked Col. Bennett what he should do in the matter, Col. Bennett said he hadn't the faintest idea. Messrs. Wittemann and Scott proceeded to War Department

and saw Col. Saltwell who most kindly telephoned to Capt. Harms in reference to all papers in this matter. Capt. Harms stated they had been sent to Capt. Clark in the Munsey Building and the matter was in his charge. Messrs. Wittemann and Scott proceeded to Capt. Clark's office and briefly stated the case to Capt. Clark and Capt. Clark said he knew nothing whatever about the matter and it did not come under him. Messrs. Wittemann and Scott returned to War Department and saw Col. Saltwell who telephoned to Capt. Harms. Capt. Harms's conversation was not heard, but Col. Saltwell said, "I distinctly understood you to say Capt. Clark had this matter in charge."

Capt. Harms reply was not heard and Col. Saltwell hung up the phone and stated "I understand the machine you refer to has been condemned by the officials at Mineola." Messrs. Wittemann and Scott then proceeded to the Munsey Building to see Mr. Waldron, who declined to see them as he was entirely too busy, but received other visitors, civilians, during their stay in the office. They, however, met Maj. Hutton, who knew nothing of aeronautics. They asked him what can the department guarantee in shape of contract covering a period of three years if sufficient money is utilized to put up a modern large factory with large output, training school, and capability of manufacturing every portion except covering and wire. He replied that no statement will be made until after passing of appropriation. Messrs. Wittemann and Scott called on Capt. Clark and asked him what type of machine did they desire, and would he kindly give drawings and specifications to work on.

He replied that the manufacturer must submit drawings and details of construction and it appeared they would be given an order. Mr. Wittemann returned to the Mills Building and saw Col. Bennett, who, while extremely busy, received him and dictated a letter in their presence, to the commanding officer stationed at Mineola, ordering him to inform the department as to whether the officials at Mineola could spare or have time to test the Wittemann-Lewis plane. Mr. Scott tried to have Col. Bennett include the order that if they did or when they could find time to make such test and report to Washington, but this was refused. Messrs. Scott and Wittemann returned to New York and on May 2 proceeded to Mineola. Capt. Kilner being busy, they took up the matter with Capt. Bretts, the adjutant of the post, who referred them to Capt. Martin. In an interview with Capt. Martin, they referred to the fact that their machine had been condemned by Mineola without any test. Capt. Martin stated that he had examined the machine and found many faults that made it unfit for service, and he would recommend that it was not purchased. After a little time, Capt. Martin produced a copy of the letter which condemned the machine and verbally stated the main objections. These objections were listened to by Messrs. Wittemann and Scott with utmost courtesy and interest. They consisted of trivialities that were absurdities, but they refrained from any but courteous comment and did not even smile. They avoided hurting the young man's dignity, or his wonderful confidence in his knowledge of aeronautical matters, being superior to that possessed by any one else in this country.

The objections to the machine were somewhat as follows: Bolts joining landing gear to body were not straight. The curve at this point necessitated a curved bolt. The landing gear, being of a new type, was condemned, although of the most modern, simple, and effective known. The exhaust, being overhead, was condemned, although this is now considered the best practice abroad; it avoids pouring noxious gases, oils, etc., in face of pilot and observer and obscuring their vision. He objected to some of the wires being heavier or stronger than the standard turnbuckle. He objected to the tail landing skid, although of latest and best approved pattern. He objected to the lightness of some wires, although stronger than actually required. He objected to the heavy wires on each side of the observer's seat, as that person could not leave with rapidity he deemed essential. He objected to the color of the machine. It is painted a battleship gray to reduce visibility. He objected to a small amount of play in the control, this being similar to the wheel of an automobile. He objected to the fact that the Curtiss shoulder control was not installed, and that the Depp control has been discarded for a long time, and all modern machines are equipped with the Depp control. He objected to the exhaust, as it was cracked. The crack was a surface crack in the metal. We may have overlooked some of the more ridiculous objections, but the main are given and the full details are on file in the department, embodied in his letter. This young man condemns the machine and bases such condemnation on the above-mentioned grounds. After he had looked over the machine, he was encouraged to expand and, under general influence of admiring audience, who hung on his words, he stated that he could not understand how anyone that had ever built a machine could possibly turn out such a mass of blunders.

From his conversation I gathered that he was educated in the Curtiss factory and had never as yet flown in anything but a Curtiss machine. He confidently stated

that the Army would not consider any other machine except the Curtiss for training purposes, and that nothing but the Curtiss JN type was worthy of consideration. Messrs. Wittemann and Scott earnestly thanked Capt. Martin for his courtesy and information and left the station. He condescended to say that the Curtiss machine was open to improvements and if we followed his advice we might turn out a creditable machine.

The analysis of the above gives the following, which stand out with a distinctness that is obvious:

Capt. Harms misled Messrs. Wittemann and Scott when he stated the commanding officer at Mineola would be forthwith to test the machine.

Capt. Harms misled Capt. Saltwell when he stated that the matter was in charge of Capt. Clark.

That in conversation with Capt. Clark he stated that manufacturers must submit drawings and specifications of this machine.

Capt. Martin condemns a machine in every point that differs from the Curtiss and will not pass any other.

That Capt. Clark approved of the color and also our proposal to use a new color to render the visibility of the machine even less, which if successful could then be adopted for the scout and battle planes.

Of course, if the officers in charge of reports and tests are so wedded to the Curtiss type that no other will be passed, the aeronautical industry must, as far as the Government is concerned, be left entirely in their hands, and the brains, experience, tests, capital, and ability of all others be pushed into the background and forced to wait a commercial business of sufficient volume to warrant further expenditure of capital in enlarging plants to meet a very grave and serious crisis that is of immediate and pressing importance.

It is not to be understood, or even thought, when reading the above that any charge of bribery or similar matters is intended. It is merely the result of conditions where the officials have been brought up to believe either by advertising or by being trained in Curtiss school, factory, selling force, and other parts of their organization, that the Curtiss machine is the only one that is worthy of consideration.

Capt. Martin kindly remarked in his approval of the main strut fittings on the Wittemann model:

Whereas we recognize the fact that the young men who have the inspection of machines and on whose recommendation the officials base their final judgment are earnest and act according to their understanding, they have been trained by the Curtiss Co. We understand from Capt. Martin the fact that he had never flown in any other machine. Yet this gentleman's opinion can condemn without a test a machine built by a company that has been making machines for 11 years, devoting their time exclusively to the work, taking advantage of failures of others and improvements both here and abroad that show merit. This gentleman uses his immature and undigested information in regard to aeroplanes and condemns a machine without any test or trial, a machine that has the approval and admiration of the best practical aviators in this country. The letter from Allan Adams, their own civilian instructor, is inclosed.

Owing to the present conditions every manufacturer except Curtiss, no matter what their experience may have been, their standing and reputation as a builder, must be judged and condemned by such

STATEMENT OF MR. PAUL W. WITTEMANN.

The CHAIRMAN. Where do you live?

Mr. WITTEMANN. At present I am living at 305 Academy Street, Jersey City, N. J.

The CHAIRMAN. Are you one of the officers of the Wittemann-Lewis Aircraft Corporation?

Mr. WITTEMANN. Treasurer.

The CHAIRMAN. Who are the other officers of the company?

Mr. WITTEMANN. Charles R. Wittemann, president; Samuel C. Lewis, vice president; and Redmond F. Kernan, secretary.

The CHAIRMAN. How long has the Wittemann-Lewis Co. been a going concern?

Mr. WITTEMANN. Since 1906.

The CHAIRMAN. What has been its business?

Mr. WITTEMANN. Manufacturing, designing, and developing of aircraft and accessories exclusively.

The CHAIRMAN. To what extent had you conducted that business prior to the declaration of war with Germany?

Mr. WITTEMANN. At the time of our declaration of war against Germany we were about the fourth or fifth largest concern in America.

The CHAIRMAN. What was your capital at that time?

Mr. WITTEMANN. At that time our capital was \$75,000, although we had a greater assets than that.

The CHAIRMAN. What was your estimated production capacity at that time?

Mr. WITTEMANN. At that time we had an estimated production capacity of one machine per week of the standard type of training machine such as we had been building.

The CHAIRMAN. What machine had you been building?

Mr. WITTEMANN. At that time?

The CHAIRMAN. Before the war?

Mr. WITTEMANN. We built most of our own kind of machines.

The CHAIRMAN. Well, you can name some of them, can't you?

Mr. WITTEMANN. The monoplanes, biplanes, hydroplanes, and seaplanes.

The CHAIRMAN. Had you built the JN-4?

Mr. WITTEMANN. No; all our own designs.

The CHAIRMAN. Satisfactory flying planes?

Mr. WITTEMANN. Every one, except, of course, the experimental machines, some of which were not.

The CHAIRMAN. How large a force of skilled workmen had you in your organization?

Mr. WITTEMANN. We had up to 40 men.

The CHAIRMAN. After the declaration of war, please state what activities, if any, the company exercised in trying to secure orders.

Mr. WITTEMANN. Just at the time of the declaration of war we had finished the development of training machines in special compliance with the specifications of the Aviation Section of the Signal Corps.

The CHAIRMAN. That is before the war?

Mr. WITTEMANN. It was completed just after war was declared.

The CHAIRMAN. When did you get the contract for that?

Mr. WITTEMANN. We never got a contract for them. They requested us to develop a machine, after which they promised to give us business.

The CHAIRMAN. When did the Signal Corps request you to develop that machine?

Mr. WITTEMANN. It was at the conference held in Washington between my brother, Charles R. Wittemann, Samuel C. Lewis, and Mr. Scott, at that time second vice president. They had a conference with Maj. William Mitchel.

The CHAIRMAN. Give the date.

Mr. WITTEMANN. It was October 16, 1916.

The CHAIRMAN. And that machine, you say, had just been completed?

Mr. WITTEMANN. After that conference they stated that if we could build a machine that could be flown successfully from our factory to Mineola, Long Island, they would accept that machine and place an order for 20 more.

The CHAIRMAN. When was this machine ready for test?

Mr. WITTEMANN. It was ready to get the test on April 16.

The CHAIRMAN. Ten days after our declaration of war?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Was the test successful?

Mr. WITTEMANN. The machine rose from Newark and flew directly to Mineola.

The CHAIRMAN. What engine was used in that machine?

Mr. WITTEMANN. The Hall-Scott 90.

The CHAIRMAN. Who flew?

Mr. WITTEMANN. Alan Adams, at that time chief instructor at the Mineola training service school.

The CHAIRMAN. In the Government service?

Mr. WITTEMANN. Not in the service, but a civilian instructor.

The CHAIRMAN. As a result of that test did you come down to see about the contract?

Mr. WITTEMANN. Yes, sir. That machine was flown to the field, and as per our promise a two-hour advance notice was given them that the machine was on the way, so that they might have an opportunity to do a little reconnoissance work. They sent up probably five or six machines to find this machine coming in. Of course, at the same time, Mr. Adams attempted to evade them and successfully did that. He had the machine on the field tied down in front of headquarters 15 minutes before the first man came back. It remained on the field 30 days, during which it rained at least once a day, and then the sun shone, and it was subject to bad treatment.

The CHAIRMAN. Wasn't it under shelter at all?

Mr. WITTEMANN. No, sir; it was in the open.

The CHAIRMAN. Were there no hangars there?

Mr. WITTEMANN. There were, yes, sir; but they were mostly filled. There were a number of other machines standing on the field.

The CHAIRMAN. Did you attempt to obtain shelter for it?

Mr. WITTEMANN. Yes, sir; but they said they could not provide shelter for it.

The CHAIRMAN. Did that result in injury to the machine?

Mr. WITTEMANN. It did not.

The CHAIRMAN. It stood the weather conditions?

Mr. WITTEMANN. Perfectly. At the expiration of these 30 days, why, we turned the propeller over three times for the sake of priming the motor, and on the fourth time it went right away, and the following morning Mr. A. Adams flew it to the adjoining field.

The CHAIRMAN. Why didn't you leave it there?

Mr. WITTEMANN. Because they refused to give us a test.

The CHAIRMAN. What was the reason assigned for that?

Mr. WITTEMANN. I can give you a more accurate statement from this. [Indicating paper.] On the request of Mr. Scott to test the machine in any manner deemed best the commanding officer declined unless he received positive instructions from Washington to do so. Mr. Scott and Mr. C. R. Wittemann proceeded to Washington and had an interview with Col. Saltzman, who stated they wanted all the good machines they could obtain, but it would be proper to take the matter up with Col. Bennett's department, as such matters came directly under his charge.

The CHAIRMAN. Then you set out to see Bennett?

Mr. WITTEMANN. Yes, sir. Col. Bennett was not there, so they were sent to Capt. Harms, and he stated that he would instruct the commanding officer at Mineola to test the machine. A few days later Mr. C. R. Wittemann and Mr. Scott saw the commanding officer, Capt. Kilner, who stated that he had not received the proper authority. After a week's time had elapsed, during which period no test was made, they were informed that the machine had been carefully photographed and inspected by the officers and the Curtiss experts. This information was obtained from Army boys that were about the field.

The CHAIRMAN. Were these officers told on this occasion of the understanding under which this machine had been constructed?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Do you know what reply was made to that?

Mr. WITTEMANN. Well, at that time they made the reply that Mineola was no longer a testing ground, and that it would probably have to be removed to Langley field. Work at Hampton, Va., at that time had barely started in order to put it in shape as any kind of a testing field.

The CHAIRMAN. Who said that?

Mr. WITTEMANN. Col. Bennett.

The CHAIRMAN. Col. Bennett?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Was any offer made to take it to the Langley field?

Mr. WITTEMANN. Yes, sir. That was made toward the middle of June. I believe it was June 6.

The CHAIRMAN. Before we get to June, let us get back to the Mineola field. You say that you flew the machine from the Mineola field to an adjoining field. What field was that?

Mr. WITTEMANN. That was where Camp Mills is now.

The CHAIRMAN. Was that a Government field or a private field?

Mr. WITTEMANN. The L. W. F. people had a hangar on it, which we rented.

The CHAIRMAN. What tests were made?

Mr. WITTEMANN. There the machine was kept flying daily, all day long.

The CHAIRMAN. By some one in your employ?

Mr. WITTEMANN. Men in our employ, and Army officers, a Royal Flying Corps man, and other civilian aviators. One of the severest tests was made by Edward Stinson. He was at that time the chief tester for the Curtiss Co.

The CHAIRMAN. He was sent there to test it?

Mr. WITTEMANN. By a party who was interested in purchasing some of the machines, with a view to establishing a private school in Oklahoma. It was put through all kinds of tests that you could possibly put it through, and through tests which no one believed it would stand up under.

The CHAIRMAN. Why did you discontinue flying there, if you did discontinue?

Mr. WITTEMANN. On July 2, 1917, we discontinued flying there through the sale of the machine to this party, in addition to three others. The machine was then withdrawn and we started work immediately, because it was a rush order. We had to get these ma-

chines under way quickly, and had the motors ordered. Then the Aviation Section denied us the delivery of those motors, whereupon the contract, of course, automatically canceled itself.

The CHAIRMAN. That is, you made a contract to build three of those machines for other parties?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And as the Government canceled or countermanded the order for motors, you were unable to deliver them?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What became of them?

Mr. WITTEMANN. They are still at the plant, with the money tied up.

The CHAIRMAN. Now, go ahead and tell us, as briefly as you can, what efforts, if any, were made by your company to secure Government work in aeroplane construction?

Mr. WITTEMANN. That was started in January, 1915.

The CHAIRMAN. 1915?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. I prefer, unless Senator New objects, that you give your experiences after we went into the aviation business, so to speak, or after this aviation production board was organized.

Mr. WITTEMANN. Only after the board was organized?

The CHAIRMAN. After the declaration of war.

Mr. WITTEMANN. I have quite a lot that preceded that.

The CHAIRMAN. You had got no contracts prior to that time?

Mr. WITTEMANN. No, sir; although we bid on all except one.

The CHAIRMAN. Your efforts date back to 1915, but without success, except as you were ordered to build this one machine?

Mr. WITTEMANN. In October, 1916. That was a verbal request.

The CHAIRMAN. After you built that machine and after you flew it successfully, tell what took place with regard to manufacturing machines.

Mr. WITTEMANN. There was a continuous succession of interviews held in Washington between my brother, Charles R. Wittemann, and Mr. Scott. Mr. Scott remained down here permanently all last summer, and he was sent from pillar to post, so to speak, interviewing all the officers that he could get hold of, and the chief one was Lieut. Farwell, who had made promises and who had written some letters, some of which we have here, in which he recognizes the capabilities and facilities of our plant and organization.

The CHAIRMAN. If you have any letters upon that subject that you would like to incorporate in the record, just identify them.

WASHINGTON, August 18, 1917.

From: A. D. Farwell.

To: Mr. Hutchinson Scott, care of New Willard Hotel, Washington, D. C.

Subject: Plant of Wittemann-Lewis Co.

1. Regarding your request, permit me to say you have presented the facilities of the Wittemann-Lewis Aircraft Co. to this division in a very thorough and concrete manner, and we are giving it careful consideration. We realize that the Wittemann-Lewis Co. is one of the oldest aeroplane manufacturers in the country, and we are giving that fact, together with your facilities, our most careful attention.

2. Mr. Sheplar, who is in charge of the plane production department, is thoroughly acquainted with your facilities, and we wish to assure you that this company has not been turned down.

3. We were not able to give them an order for training planes, but by far the larger part of our program is still ahead of us, and while we can not say definitely at the present time whether an order can be placed with them, you can rest assured that they

will receive proper attention, and that your efforts in their behalf will not be neglected by this division. Since you are permanently here in Washington, when we are ready to negotiate with this company we will get in touch with you at once.

Very truly, yours,

(Signed) EQUIPMENT DIVISION.
By ALBERT D. FARWELL.

Mr. WITTEMANN. I may say a few more words, then, in regard to the testing of the machine at Langley field?

The CHAIRMAN. Very well. Was this machine sent to Langley field?

Mr. WITTEMANN. No. They advised us under date of June 7, 1917, that the plane could be tested as soon as we set the machine up at the aeronautical experiment station and proving grounds, Hampton, Va. The request was signed by Henry Souther. That was June 27, 1917. Now, that was after the machine had been severely used and bounced around and subjected to outside weather conditions, and it was hardly fit to send out for testing. The motor had been considerably run down after probably 300 flights.

The CHAIRMAN. What reply did you make.

Mr. WITTEMANN. The reply was that since we had some new machines under way would it not be more advisable to test one of the new machines after they came out. They replied that it would be a good deal better to do that. Directly after that reply we received information from them, on June 21, that absolutely no new types of machines would be considered since they had decided upon the JN-4 Curtiss machine and the Standard machine.

The CHAIRMAN. What date was it you were notified that your type of plane would not be considered because they had selected the Standard and the JN-4? What is the other one?

Mr. WITTEMANN. The Standard. I think it was model H. Then there was the Curtiss JN-4.

The CHAIRMAN. The Standard and the Curtiss JN-4?

Mr. WITTEMANN. Yes; the Standard and the Curtiss JN-4.

The CHAIRMAN. About what date was that?

Mr. WITTEMANN. I believe it was about the first part of July.

The CHAIRMAN. That notification came under the signature of what person?

Mr. WITTEMANN. It came in a verbal conversation between Lieut. Farwell and Mr. Scott, who then stated that they could not consider any concern that could not produce at least 500 machines in 12 months. There was probably no concern that could do that at that time.

The CHAIRMAN. Five hundred in 12 months?

Mr. WITTEMANN. Yes, sir. They could not do it without equipping for it. We made arrangements for it. Following that, on August 6, he made the statement that they could not consider anything less than 1,000 planes in order to come near the program. We proceeded to make arrangements. We had already made some arrangements. We had made arrangements with the Brill Co. to take over the Stevenson plant, which is now the Standard Co.

The CHAIRMAN. Did you notify Lieut. Farwell?

Mr. WITTEMANN. We notified him. Lieut. Farwell apparently told Mr. Curwin and his associates the same thing that he told Mr. Avram, whereupon Mr. Curwin thought it more advisable to with-

draw from the association than to go ahead with it thereby causing a severe injury.

The CHAIRMAN. You said a while ago that you had some written memorandum.

Mr. WITTEMANN. Yes, sir. It is a résumé of the memorandum of Mr. Curwin to the J. J. Brill Co., of June 12.

The CHAIRMAN. What was the capacity of the Brill Co.?

Mr. WITTEMANN. The capacity of that plant would have developed up into 1,500 machines in 12 months.

The CHAIRMAN. What was the business of the Brill Co.?

Mr. WITTEMANN. They were car manufacturers. The Stevenson plant was owned by them. It was empty. They wanted us to manage it while they financed it.

The CHAIRMAN. If I understand it, you were prepared to meet the capacity requirements of the Production Board as fast as they informed you of those requirements?

Mr. WITTEMANN. Exactly.

The CHAIRMAN. Did you report that to them?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What difference did that make in their action?

Mr. WITTEMANN. It merely led on to further conversations that gradually smothered out again.

The CHAIRMAN. Did you invoke the intercession of Senator Frelinghuysen at any time?

Mr. WITTEMANN. At one time in a conference Mr. Scott suggested that it be brought to the attention of Senator Frelinghuysen; that is, it was presented to him in a letter dated August 16.

The CHAIRMAN. I have here a copy of a letter from Senator Frelinghuysen, dated August 18, 1917, to S. D. Waldon.

Mr. WITTEMANN. Yes; that is right.

The CHAIRMAN. Together with a letter of the 22d of August, 1917, from Mr. Waldon to Senator Frelinghuysen.

Mr. WITTEMANN. That is right.

The CHAIRMAN. And the Senator's reply upon the 28th of that month, which I suppose you have in your possession, too.

Mr. WITTEMANN. No; I have not got that copy. I had a copy of the letter written to Senator Frelinghuysen on August 22, and the letter of August 16, written by Mr. Scott to the Senator.

The CHAIRMAN. I think I have that, with the exception of page 5, which seems to be missing. I think that should go in also. Page 5 is not among these papers.

Mr. WITTEMANN. I have it here.

The CHAIRMAN. When this transcript is sent to you for correction. I wish you would have that letter inserted. You can make a copy of it, and that will not mutilate your files.

Mr. WITTEMANN. All right.

AUGUST 16, 1917.

Hon. J. S. FRELINGHUYSEN,

United States Senate, Washington, D. C.

SIR: The Wittemann-Lewis Aircraft Co., of Newark, N. J., has been interested for the past 16 months in the securing of orders for airplanes. To date, it has been unsuccessful, and the undersigned is this day advised that all contracts for airplanes of training type have been let and that the entire supply of such machines necessary for the training of American military aviators is thereby provided for.

Following is a statement of the history of the Wittemann-Lewis Co., its standing in the airplane world, and a recital of its endeavors to obtain governmental business.

History.—The Wittemann-Lewis Aircraft Co. is composed of the brothers Charles, Paul, and Walter Wittemann, and S. C. Lewis, a flyer of note, who has trained many of the French and Russian officers.

The three Wittemann brothers secured their education at as many different schools of technology. To this was added practical knowledge through construction of gliders and airplanes and through actual flying experience of the principles of aerodynamics, flight, and internal combustion engines.

They began in 1904 to work in aerodynamics, experimenting with gliders, as did the Wright brothers, Voisins, and other famous men of flying history. With the production of engines in any way suitable for airplanes, they began experimentation with power-driven machines and were easily successful.

Reputation.—They became widely known through these experiments and there came many orders for experimental and standard-type machines for exhibition and other purposes. In the course of time they attained an enviable reputation for sincerity, square dealing, ability, and quality of work. At no time were they ever large contenders for business, and it is well known that until the past year there were but two or three concerns in the entire country which did any volume of business in the manufacturing of airplanes.

Organization of the company and dealings with the Government.—In view of the suddenly increased demand for aircraft, the Wittemann-Lewis Aircraft Co. was formed with the added services of S. C. Lewis.

In November, 1916, Gen. Thomas Crouse introduced Mr. Charles R. Wittemann, Mr. S. C. Lewis, and Mr. Hutchinson Scott to (then) Maj. Mitchell, assistant to (then) Col. Squier.

In the presence of the above-named gentlemen Mr. Mitchell stated that he knew the Wittemann firm and that the Army needed planes; that just as fast as the Wittemanns could build training type planes and deliver them to the Mineola Field, the machines would be inspected and accepted and paid for within two weeks if they were approved.

In accordance with these expressions of opinion, a factory in Newark was acquired and as soon as possible a training-type machine was built and exhibited at the aero show in February last, where it received favorable comment.

For the first time in American aviation history this machine was flown from factory to destination—from the Newark plant to Mineola. The pilot was Allan S. Adams, one of the instructors at the Army Aviation School at Mineola.

The day after the machine was delivered at the field a general order was published forbidding any machine except those of the Army landing at this point. Mr. Scott, of the company, requested that a test be made of this machine. It was thereupon stated by the commanding officer that in the absence of instructions to this effect, he could make no test until officially notified.

Mr. Scott proceeded to Washington and saw Col. Squier's assistant, who stated they desired all training type machines that could be produced that were good and referred him to Capt. Harms.

Mr. Harms referred Mr. Scott to a Mr. Walker in the Munsey Building. He, Mr. Scott, was then passed to Maj. Hutton, who could do nothing. Maj. Sautells could not aid. Mr. Waldon was seen and stated that nothing could be done as Mineola was no longer a testing station and the machine could not be tested at that point. In the meantime, this machine was allowed to remain exposed to the elements and it rained most of the time for six weeks. The Wittemann-Lewis Co. then obtained the use of a hangar on Hempstead Plains and with its aviator almost gave daily demonstrations of this plane's ability. For about two months this machine was handled by many of the best-known aviators and pronounced to be the best training-type machine they had ever handled.

Attached is record of Mr. Stinson's tests. Within three weeks after these demonstrations began an official order was posted on the hangar notifying the Wittemann-Lewis Co. that only Government machines would be allowed to fly over or in the vicinity of Mineola field. At the request of Mr. Scott, permission was later granted the company to fly the machine.

Despite the weeks that the machine was subject to all the elements and to all sorts of flying, looping, diving, and the like, and the carrying of many passengers, no repairs or alterations were necessary and the machine is at present in perfect condition. During all these flights the machine outclassed, in speed, at least, the Army machines of higher power. The machine was likewise handier in maneuvering.

A representative of the Wittemann-Lewis Co. came to Washington and proffered all its facilities, and also stated these would be increased and such facilities would be placed at the disposal of the Government.

The capacity of the present factory is 600 machines in 12 months and this capacity could be increased with utmost rapidity until a maximum of 15 machines obtained—4,500 machines yearly; 200 machines a year could be built with the present facilities. The vice president of the company was delegated to remain in Washington at the disposal of the Aircraft Production Board.

Mr. Scott for the last two months has called repeatedly on the Aircraft Production Board and to date has been unable to see any of the heads of such board. He has been able to meet minor officials only. He met Mr. Farwell, Mr. Shinn, Mr. Stokes, and a request for an interview with higher officials has been refused. Mr. Stepler refused to see him on August 14, although passed up to him by Mr. Shinn. On August 5 Mr. Scott waited until 5 p. m., and although he sent a letter of introduction from Senator Frelinghuysen to Mr. Waldron, the latter referred him to Mr. Stepler, who would not see him. Finally, on August 16, after being turned down by all other officials, was granted an interview by Mr. Farwell. Col. Boruff, of California, was present during this interview and had hereunto subscribed his name as verifying the facts as stated.

Mr. Farwell stated: (1) The board was familiar with the Wittemann-Lewis Co.; (2) the factory had been inspected, (3) the entire allotment of training type machines had been contracted for, (4) the Wittemann-Lewis Co. had not been included in the contract, (5) that among such contracts some had been let to firms that had never built an airplane, (6) they had let contracts to Dayton-Wright Airplane Co. and the Fisher Automobile Co., in both of which companies, it is understood, Mr. A. E. Deeds is an officer, while at the same time is an official of the Aircraft Production Board and a member of one of the board of the Council of National Defense.

Conclusion.—The statement then results in the fact that the Wittemann-Lewis Aircraft Co., composed of men with international reputation, has been unjustly and persistently overlooked and ignored, subjected to unwarranted expense, time, and trouble, and discriminated against in favor of corporations which have had no experience whatever in this class of work. And this at a time when the country requires the best and the exertion of every effort.

The above submitted for your earnest consideration and whatever action you in your judgment may deem to be for the best interest of the country at large.

I beg to remain,

Yours, sincerely,

(Signed) HUTCHISON SCOTT.

The CHAIRMAN. Did you ever get any business from the Production Board?

Mr. WITTEMANN. We have had several offers, but we never actually received any after all these different promises. On August 29 Mr. Waldon had promised Mr. Scott that we would be given a contract for Monocog (?) body planes. That was a type similar to the L. E. F. Co.'s type. They asked for deliveries on the contract to the extent of 600.

The CHAIRMAN. With what result?

Mr. WITTEMANN. No result.

The CHAIRMAN. But you did contract for some spare parts?

Mr. WITTEMANN. Following that, on September 11, Mr. Scott had another conference with Lieut. Farwell and Mr. Waldon to find out why we did not get anything out of the previously promised contracts. Then instructions were issued—I presume this was Maj. Shepler; it says Stevens here—to give us a contract for sufficient spare parts to keep us busy until they required our facilities.

The CHAIRMAN. That was for 300 spares.

Mr. WITTEMANN. They placed it at 300. There was a variety. There was from 30 of one thing to 300 of another thing, etc. On the whole it amounted to an order of approximately \$300,000.

The CHAIRMAN. What date was that?

Mr. WITTEMANN. That list was given to Mr. Scott and Mr. C. R. Wittemann on September 12, I believe.

The CHAIRMAN. They were to be manufacturing the spare parts?

Mr. WITTEMANN. The spare parts.

The CHAIRMAN. The designs were to be furnished by the Curtiss Co.?

Mr. WITTEMANN. The designs were to be furnished by the Curtiss Co. Then they were to send to the Curtiss Co. to get the blue prints, as they had no additional sets down there, and Mr. Scott and Mr. Wittemann went directly to Buffalo.

The CHAIRMAN. Let me call attention to a letter from Mr. C. R. Wittemann to Senator Frelinghuysen, which I think will shorten the examination. This letter is dated March 6, 1918, and reads as follows:

WITTEMANN-LEWIS AIRCRAFT Co. (INC.),
Newark, N. J., March 6, 1918.

Hon. J. S. FRELINGHUYSEN,
United States Senate, Washington, D. C.

DEAR SIR: This is in reply to your communication of the 28th, asking us to furnish you with information with reference to Col. Horner's statement that we had been offered a contract for 300 spares, etc.

About September 1, 1917, Mr. S. D. Waldon (now Col. Waldon) offered to permit us to submit figures on spare parts to be manufactured from designs of the Curtiss Aeroplane Co., and instructed Mr. Hutchinson Scott, who was then second vice president of our company, to call on Maj. P. L. Shepler in Buffalo, stating that he would instruct Maj. Shepler to give us an order for the 300 parts. Lieut. Farwell then stated that the order would be ready the following day, whereupon Mr. Scott summoned our Mr. C. R. Wittemann to Washington. Lieut. Farwell gave them a list of parts with a sealed letter to Maj. Shepler and instructed them to go to the Curtiss factory. On arrival at that factory at Buffalo, they were refused the blue prints, but Maj. Shepler said he would take the matter up with the Curtiss officials. Finally Messrs. Wittemann and Scott were taken to the office of Mr. B. A. Guy, the secretary and treasurer of the Curtiss Co., who stated that we would have to enter into an agreement with the Curtiss Co. and that the form of agreement would be forwarded for execution in about 10 days time.

On September 20 the Curtiss Co. sent us a letter and form of contract (copies inclosed). From this you will notice that in order to manufacture the parts it would be necessary for us to pay to the Curtiss Co. 1 per cent of the selling price of the parts plus the sum of \$200 on each plane. Likewise, that we pay them the sum of \$500 in advance, being 1 per cent on a possible order of \$50,000.

We sought the advice of our counsel, Mr. Loren N. Wood, who suggested that under the circumstances he thought the Curtiss Co. would be willing to modify the agreement, at least in two particulars, and we thereafter wrote the Curtiss Co. a letter dated October 30, a copy of which is inclosed. To that we have received a reply dated November 6 (copy inclosed). We did not feel that, in order to bid upon Government work we should be compelled to pay the Curtiss Co. \$500 in advance, although we were quite willing to pay for the expense in having the necessary blue prints made upon which our bid was to be based.

On February 28, at our request, we were granted an interview with Col. Horner, at which time he referred to an interview he had had with you and asked why we had not accepted an order for 300 spare parts. He was then informed of the agreement which the Curtiss Co. required and especially of the causes to which we have above referred. He was also advised of our plant, organization, and that we had been in business for 12 years, during which period we have built approximately 300 aeroplanes for some of the best known aviators and which have been flown all over this country as well as in foreign countries. He was also advised of the report made by Messrs. Slocum, Abram & Slocum, submitted on December 2, 1917, a copy of which we are sending you under separate cover. Col. Horner stated that he did not know of these facts nor of the report.

We are able to contract for and deliver 600 machines in the first 12 months and 100 machines per month thereafter. We believe that we are in an exceptional position, with an established plant, equipment, and an organization of experienced men. We are desirous of serving our country in the manufacture and production of aeroplanes and we can not understand why we, who are one of the oldest manufacturers of aircraft in this country, have not been given an opportunity.

Respectfully, yours,

WITTEMANN-LEWIS AIRCRAFT Co. (INC.),
By C. R. WITTEMANN, *President*.

This agreement, made this day of September, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the Wittemann-Lewis Aircraft Co., a corporation of the State of New Jersey, having its principal office in the city of Newark party of the second part.

In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, as designed and built by the party of the first part.

The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part one per cent (1%) of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs, and also to pay to the party of the first part the sum of two hundred dollars (\$200.00) for each and every aeroplane so manufactured, all such payments to be made to the party of the first part not later than the 10th day of each month for all aeroplanes or parts thereof manufactured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of five hundred dollars (\$500.00) in payment of the one per cent (1%) charge on the first fifty thousand dollars (\$50,000.00) of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of five hundred dollars (\$500.00) shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of fifty thousand dollars (\$50,000.00).

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used, by any persons other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specifications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof, the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective corporate seals to be hereunto affixed the day and year first above written.

CURTISS AEROPLANE Co.,

By
Secretary and Treasurer.

WITTEMANN-LEWIS AIRCRAFT Co.,

By

The CHAIRMAN. That is in accordance with your understanding of the matter?

Mr. WITTEMANN. Exactly.

The CHAIRMAN. Accompanying this letter I find a copy of an agreement dated the —— day of September, 1917.

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. That seems to be a proposed agreement between the Curtiss Co. and the Wittemann-Lewis Co. I will show this to you and ask you if that is a copy of the contract which the Curtiss Co. and the Wittemann-Lewis Aircraft Co.—

Mr. WITTEMANN (interposing). It has the Curtiss seal on it.

The CHAIRMAN. It has the Curtiss seal upon it?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Among these papers which I have in my hand I find the following copy of a letter from the Curtiss Co., dated September 20, 1917, to the Wittemann-Lewis Co.:

BUFFALO, U. S. A., *September 20, 1917.*

WITTEMANN-LEWIS AIRCRAFT Co.,
Newark, N. J.

DEAR SIR: This is to advise you that the blue prints and specifications covering the parts for the JN4 machines which you intend to manufacture have been completed and are ready for delivery to you.

We inclose herewith form of agreement in duplicate which we would ask that you execute, returning both copies to us together with your check for \$500 as provided in the said agreement.

Upon receipt of this agreement, duly executed by you, together with the said check, we will execute and return one copy of the agreement for your files, and deliver to your representative the blue prints and specifications hereinabove mentioned so that he may check same and give us a receipt therefor.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, *Secretary and Treasurer.*

The CHAIRMAN. Do you recall receiving that letter?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. As accompanying this agreement?

Mr. WITTEMANN. Yes, sir; they were both together. The other copy of the agreement I have here.

The CHAIRMAN. Among the papers there is also a copy of a letter dated October 30, 1917, purporting to be from your company to the Curtiss Aeroplane Co., suggesting changes in the agreement. The reasons given are that you do not want to encumber with this fee machines or parts that are manufactured in accordance with your own designs, and also that the prices indicated by the Government are so much below what it will be necessary for you to receive and that you have no assurance whatever that you will obtain a contract; you do not feel that you are in a position to spend \$500 for drawings and specifications just to use for making a bid to the Government.

Do you remember that?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. That letter was sent to the Curtiss people?

Mr. WITTEMANN. Yes, sir; on October 30.

The CHAIRMAN. I also find a purported copy of a reply, in which the Curtiss Co. declined to permit the amendments which are proposed.

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. All of these will go into the record.

OCTOBER 30, 1917.

CURTISS AEROPLANE Co.,
Buffalo, N. Y.

GENTLEMEN: Referring to the form of agreement which you sent us on September 20, there are two changes which we would like to have inserted.

(1) At the end of paragraph 3 on the first page, a clause reading as follows:

"It is understood by the parties that the party of the second part is now and has been designing and manufacturing aeroplanes and parts and it is not intended by this agreement that the party of the second part shall by reason of this agreement be obligated to pay to the party of the first part any sums of money for manufacturing aeroplanes or parts in accordance with its own drawings, designs, and specifications."

(2) In place of the fourth paragraph on the first page, a paragraph to read as follows:

"The party of the second part agrees to pay to the party of the first part the sum of \$500 immediately upon the acceptance of an order for one or more machines or parts thereof, to be manufactured in accordance with said drawings and designs which shall

be in payment of the 1 per cent charge on the first \$50,000 worth of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of \$500 shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell such aeroplanes or parts thereof equalling the sum of \$50,000."

The reason for considering the first clause is obvious; namely, that we do not want to encumber with this fee machines or parts which are manufactured in accordance with our own designs. The reason for the second is that the prices indicated by the Government are so much below what it will be necessary for us to receive that we have no assurance whatever that we will obtain a contract, and we do not feel that we are in a position to spend \$500 for drawings and specifications just to use for making a bid to the Government. Of course we are quite willing to pay whatever expense you have incurred in having this set of blue prints struck off for our use and to have you protect yourselves in any way that you deem necessary against any use of them at this time for any other purpose than preparing a bid. At the time it was suggested to us by the Government that we submit a bid under these plans and specifications we received the impression that the payment of 1 per cent would only be upon the machines or parts manufactured, and that was the basis of our undertaking to submit a bid

Kindly advise us if this is agreeable to you.

Yours, very truly,

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
_____, *President.*

BUFFALO, U. S. A., November 6, 1917.

THE WITTEMANN-LEWIS AIRCRAFT CO. (INC.).

Newark, N. J.

DEAR SIR: Replying to your letter of October 30. In regard to the first change you desire in the agreement we sent you, I do not think it advisable to make the change suggested by you, as the fee mentioned in the third paragraph on the first page of the agreement applies only to our aeroplane model known as the JN military tractor, and does not cover any machines that may be manufactured according to your own designs.

In regard to the second change which you desire in place of the fourth paragraph on page 1 of the agreement where we ask a deposit of \$500, we feel that this request is only fair to cover the expense of furnishing a set of drawings and changes which may occur from time to time, this deposit to be credited against the 1 per cent license fee as it accrues, and a further payment to be made when the accruals exceed \$500.

We do not feel that under the circumstances we should be asked to furnish information pending your receipt of order from the Government without such payment, and believe that in furnishing this information we are helping you to obtain such an order, and we should be reimbursed accordingly.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, *Secretary and Treasurer.*

Mr. WITTEMANN. There is one more interesting point. On October 30, the same day this letter was written, Mr. W. W. Montgomery, head of the legal department, entered into an agreement with the Curtiss Co. to call in any such agreements as had been made and as were outstanding, and to return any moneys that had been collected from any concern entering into such agreement.

The CHAIRMAN. Can you furnish a copy of that letter when you correct your testimony?

Mr. WITTEMANN. Yes, sir; I can give you a memorandum.

The CHAIRMAN. Let me see that letter, please.

Mr. WITTEMANN. That was not in a letter. That was at a conference.

The CHAIRMAN. Let me see the statement.

Did the Curtiss Co. ever modify its demands on you?

Mr. WITTEMANN. No, sir. They wrote the letter six days after they entered into that agreement. They had not any right to do that, in the first place.

The CHAIRMAN. You have called my attention to the following memoranda [indicating], which is dated Tuesday, April 24, 1918, and which reads as follows:

Conference with Capt. J. C. White, Mr. W. W. Montgomery, Messrs. C. R. and P. W. Wittemann. Mr. W. W. Montgomery was called in by Capt. White. He stated that shortly after October 1, 1917, they first heard of the Curtiss Co. sending out agreements similar to the one herewith referred to. It is, however, remembered by Messrs. Wittemann and Scott that while on their visit to the Curtiss Co. at Buffalo, Mr. Guy, in the presence of Maj. Shepler, said they would have to enter into an agreement (the contents of which were not stated), and later Maj. Shepler stated to Messrs. Wittemann and Scott that any fee or overage that would have to be paid to the Curtiss Co. might be added to our contract price.

Mr. MONTGOMERY also stated that he personally, on October 30, 1917, entered into an agreement with the Curtiss Co. purchasing the right to manufacture the Curtiss JN-4 machines in whole or in part at any of the plants the Signal Corps may designate, without any further fee or agreement between the Curtiss Co. and the manufacturer.

The CHAIRMAN. Did you notify the Curtiss Co. of that.

Mr. WITTEMANN. We did not become acquainted until April 24, 1918.

The CHAIRMAN. Did you notify them of that circumstance after you became acquainted with it.

Mr. WITTEMAN. No, sir.

The CHAIRMAN. Then, the situation is substantially this: While the Government officials suggested a contract for 300 spare parts, they referred you to the Curtiss Co. for the plans, which company declined to give you the plans until you had signed a contract with them (a copy of which has been placed in the record) which you declined to do.

Mr. WITTEMAN. Yes, sir.

The CHAIRMAN. Did you ever get any other work from the Government?

Mr. WITTEMAN. After the report of Slocum, Avram and Slocum was handed in, and Mr. Ridlon made that report supposed to have been very favorable, as was stated by Maj. Shepler and Lieut. Farwell, not to me, but I have heard it said that he stated to Mr. Avram, Mr. Charles R. Wittemann and Mr. Lowry that Lieut. Ridlon personally stated that he did hand in a favorable report to the effect that we were in a very excellent position to take care of any size contract that we asked for or contemplated, and both Lieut. Farwell and Maj. Shepler agreed to that thought.

The CHAIRMAN. But you have not got Government work up to date?

Mr. WITTEMANN. They also stated they would see that we got a contract as soon as the new appropriation would come out.

The CHAIRMAN. When was that statement made?

Mr. WITTEMANN. That statement was made in the early part of January.

The CHAIRMAN. Before Mr. Ryan was placed at the head of aviation production?

Mr. WITTEMANN. Yes, sir, just about the time that Mr. Potter came in.

The CHAIRMAN. He came in later than January.

Mr. WITTEMANN. In February, just a little before.

The CHAIRMAN. Have you any contracts yet?

Mr. WITTEMANN. No, sir.

The CHAIRMAN. If, in the fall of 1917—the late summer or fall of 1917—the Government had placed with your company contracts for the production of machines at the minimum rate of 500 per year, could you have turned them out?

Mt. WITTEMANN. Yes, sir; more than that.

The CHAIRMAN. If you had been informed by Lieut. Farwell that the Government would make contracts only with those capable of turning out 1,000 machines per year, could you have performed that contract?

Mt. WITTEMANN. Yes, sir. We would have had the Brill property.

The CHAIRMAN. Did you inquire as to whether contracts were being let in other directions for less than 500 machines?

Mr. WITTEMANN. Yes, sir. We could not get definite information.

The CHAIRMAN. Did you inquire of these officers whether that was or was not the fact?

Mt. WITTEMANN. They declined to familiarize us with the facts.

The CHAIRMAN. But did you inquire?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And received an answer to the effect that they did not care to discuss these things with you?

Mr. WITTEMANN. They did not exactly make that statement, but they always got around it through some other channel.

The CHAIRMAN. Did Mr. Scott leave the employ of your company?

Mr. WITTEMANN. Yes, sir; they are Mr. W. C. Teter and his associates, of New York City.

The CHAIRMAN. Why?

Mt. WITTEMANN. A point came up at one time as to some flat accusations that he had made of some of the members of the Aircraft Board that he was not exactly sufficiently positive of to justify him in making them in respect to whether they were true or not. It had been suggested to him that it was not good policy and might injure us in the future. Thereupon, on his own accord, he stated that it might be better, in view of these statements, that he temporarily withdraw from the company.

The CHAIRMAN. You are requested, if consistent with business conditions, to give the committee the names of such bankers, firms, or individuals as were prepared to furnish the necessary financial assistance to the company for the execution of its contracts with the Government.

Mt. WITTEMANN. Yes, sir.

The CHAIRMAN. Please state what, if any, negotiations your company has had with Mr. W. C. Potter regarding Government work.

Mr. WITTEMANN. There was one conference held with him on April 20.

The CHAIRMAN. What occurred?

Mt. WITTEMANN. It was between Mr. C. R. Wittemann, Mr. Potter, and myself, at which time we discussed with him the actual conditions of the company, with which he was apparently not acquainted. He seemed to be acquainted with some of the facts. He took the stand that they could not consider giving any more orders to concerns that would have to expand. After arguing the question with him at con-

siderable length, he decided to promise us these drawings. However, we have never received them.

JULY 30, 1918.

Hon. C. S. THOMAS,
*Chairman Subcommittee, Military Affairs Committee,
 United States Senate, Washington, D. C.*

DEAR SIR: In reference to the conference held between Messrs. W. C. Potter, Charles R. Witteman, and Paul W. Witteman on April 20, 1918, Mr. Potter was first given a brief outline of the Witteman-Lewis Aircraft Co., which was prepared at the suggestion of Dr. Charles D. Walcott, of the Smithsonian Institute, at a conference between him and Messrs. Charles R. and Paul W. Witteman. After Mr. Potter read this outline, we discussed the work that this company has done and the efforts that had been made to procure a contract. Mr. Potter stated that he was well acquainted with our work, but that up to that time they had nothing to give us. We then asked him that if there were sufficient contracts to give out to start a number of new plants besides those already in existence, there assuredly must have been sufficient work to give us a contract, to which he perfectly agreed. Mr. Potter then stated that they were not going to consider the expansion of any more plants, as they were contemplating the use of existing piano factories, which, in his belief, were exceptionally well equipped for the manufacture of airplanes.

To this we told him of some inspections that we had made of piano factories, where we found they were practically equipped for woodworking only, and, as far as machinery was concerned, not enough to properly start work on an airplane in the woodworking line only, constituting about 40 per cent of airplane manufacture.

After this Mr. Potter stated that they could not afford to let all of these industries go under because of the depression of that business owing to war conditions; and we asked him whether he thought it more advisable to let the equipped airplane plants go under or the unskilled plants go under, and whether it was not only essential, but highly important to utilize the existing airplane plants, particularly since they have put the whole of their life's work into the development of the airplane and gaining of the necessary experience to conduct aircraft production.

To this Mr. Potter emphatically agreed and stated that he expected the completion of drawings of several machines by May 15 and at that time would permit us to figure on one of them. In order to confirm this, he called in his secretary and dictated a memorandum about as follows:

"Witteman-Lewis Aircraft Co. ought to receive drawings of either the Bristol or De Haviland machines to figure on from 250 to 500, or else the Handley-Page or Caproni machines to figure on as many as they would have capacity for, and these drawings will be sent immediately upon their completion, which should be May 15."

Before leaving Mr. Potter's office he promised to mail us a copy, which to this day has not been received.

Very respectfully, yours,

WITTEMAN-LEWIS AIRCRAFT CO.
 By _____,
Treasurer.

The CHAIRMAN. Did anybody see Mr. Potter again in June?

Mr. WITTEMANN. I attempted to see him once after that, about three weeks later, but he was too busy and I could not see him. He was going to New York that afternoon.

The CHAIRMAN. Mr. Wittemann, are you a native American citizen?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And your brother is?

Mr. WITTEMANN. Yes sir. The entire family.

The CHAIRMAN. The entire family are American citizens?

Mr. WITTEMANN. Yes. I was born and raised on Staten Island and I never moved from that place.

The CHAIRMAN. And your parents?

Mr. WITTEMANN. My mother was born in St. Louis; my father was born in Europe and came to this country about 52 years ago.

He was naturalized immediately afterwards. You have that in that letter [indicating].

The CHAIRMAN. My purpose in asking is to meet any possible suggestion that that was a reason for some of these things.

Mr. WITTEMANN. Yes. That was advanced as a possible theory, as having something to do with this.

The CHAIRMAN. The Germanic name borne by some members of the company might have something to do with it.

Mr. WITTEMANN. Yes, I understand, but could never find trace of it any time.

The CHAIRMAN. Is there anything else you care to say?

Mr. WITTEMANN. I do not think there is anything else that would add anything to it. There is a letter here written on April 18, from Col. L. S. Horner. Do you wish me to read it?

The CHAIRMAN. That is what date?

Mr. WITTEMANN. April 18, 1918. That was received in Newark on the day that we were down here.

The CHAIRMAN. To see Mr. Potter?

Mr. WITTEMANN. Yes, sir. We stayed over until Monday. He had merely prepared a so-called report consisting of half a dozen sheets or so, in an effort to show that we were not entitled to the business. After that I prepared this form and submitted it to him. Then Capt. J. C. White, who was acting as legal adviser, putting it altogether, has practically decided the whole thing in our favor.

The CHAIRMAN. Did you or representatives of the company have any conferences here with Capt. White?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What are his initials?

Mr. WITTEMANN. J. C. White, I believe.

The CHAIRMAN. Of the Aviation Production Board?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Please state about when that was.

Mr. WITTEMANN. Of the legal department.

The CHAIRMAN. The legal department of the Aviation Production Board. Please state its purpose and what was said and done?

Mr. WITTEMANN. He was preparing this report for Lieut. Col. Horner. I believe his initials are L. S. He had gathered together just a few sheets which did not seem to bring much weight to anything.

The CHAIRMAN. A few sheets of what?

Mr. WITTEMANN. Of memoranda which he had taken from the files, and so on. We had them straightened out in a very short time. Whatever he thought he could blame on us, we turned over and put the blame on them. They took the stand that we were prejudiced against the Aircraft Board.

The CHAIRMAN. Did he give you any reason why you were prejudiced?

Mr. WITTEMANN. He assumed we were. His actual words that he used, if I can remember them, were, "Get this grouch out of your system."

The CHAIRMAN. Was his attitude to the effect that the board should not let contracts to competent men who were prejudiced?

Mr. WITTEMANN. I am unable to answer that, as to whether that was his attitude or not, although it did appear that way.

The CHAIRMAN. Well, state his attitude.

Mr. WITTEMANN. Following that conference Capt. White had asked us to prepare the complete report, which we did.

The CHAIRMAN. Is that the report which Mr. Avram made?

Mr. WITTEMANN. No, sir; that is this report, the entire memorandum of the entire negotiations.

The CHAIRMAN. The report that you selected, then, was composed chiefly of memoranda of interviews?

Mr. WITTEMANN. Yes, sir; and correspondence.

The CHAIRMAN. Was that submitted to Capt. White?

Mr. WITTEMANN. That was submitted to Capt. White in the original form; yes, sir.

The CHAIRMAN. When was that?

Mr. WITTEMANN. On May 8, about.

The CHAIRMAN. Of what year?

Mr. WITTEMANN. Of 1918. It was approximately May 8.

The CHAIRMAN. Have you had any reply from Capt. White?

Mr. WITTEMANN. We came down with it. We brought it down with us.

The CHAIRMAN. Have you had any reply?

Mr. WITTEMANN. We spent three days in straightening the whole thing out, and he arrived at the conclusion that the whole thing was just a misunderstanding on the part of the Aircraft Board, and that there was absolutely no reason or plausible excuse why we should not get contracts.

The CHAIRMAN. Did he give you a written statement to that effect?

Mr. WITTEMANN. No, sir. I asked him for a written statement or report that he drew up, but he never did it.

The CHAIRMAN. But he verbally acquitted you after this showing?

Mr. WITTEMANN. Absolutely.

The CHAIRMAN. Of entertaining any prejudice against the board or its officers, or of any misconduct which would interfere with a fair deal from the Government?

Mr. WITTEMANN. Absolutely, and in addition he stated that there was no reason why we should not have a contract, and that there was every reason why we should.

Mr. AVRAM. I understood from the report that they objected to a letter which I wrote to Mr. Coffin.

Mr. WITTEMANN. Yes. That letter I have here. Would you like to read that letter? That was one of the serious objections the day we were in conference with Mr. Potter. Mr. Potter had it on top of his file and Mr. Kellogg had it on top of his file.

The CHAIRMAN. When you had the conference with Mr. Potter in April was any reference made to a letter of the 17th of April addressed to Mr. H. E. Coffin.

Mr. WITTEMANN. It was right on the top of each man's file.

The CHAIRMAN. To Mr. Coffin from Mr. Avram?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Is the letter which I now hand you a copy of it?

Mr. WITTEMANN. Yes, sir; that is a copy of it.

The CHAIRMAN. Will you attach a copy of that letter to your testimony when it is sent to you for correction?

Mr. WITTEMANN. Yes, sir.

APRIL 17, 1918.

Mr. H. E. COFFIN,

Chairman the Aircraft Board, Washington, D. C.

MY DEAR MR. COFFIN: Upon my return from Washington, I found your letter of April 9 in reference to the Wittemann-Lewis Aircraft Co.

I trust that my communication of March 12, handed to you by Mr. Bezner, has not given you the impression that I considered the Aircraft Board to be an executive body dealing with contracts. I know quite well that it is not, which was one of the main reasons why neither the Wittemann-Lewis people nor our concern has approached your board.

We regret to say, however, that experience has proven that every means was employed to properly approach those in charge of the letting of contracts and that very little attention has been paid to the fact that this company can be of great service to the Government in producing airplanes.

I have personally arrived at some very definite conclusions—the main one being that the power of letting contracts was left in the hands of men who perhaps in their previous experience were not placed in as important positions as the ones they now occupy with the aircraft situation and who were not familiar with the ordinary forms of business courtesy. I have deduced this from my own experience with the department, from many people who came in touch with the aircraft order department and from the way the Wittemanns were received and treated.

It seemed at the time of these interviews that the officers having charge of letting contracts had set views regarding the Wittemann-Lewis Co. which they had probably formulated months or a year before, and that nothing new could move them to reconsider the Wittemann-Lewis aircraft situation which when presented by us had an entirely different aspect than when presented months earlier.

As a matter of fact, the situation of the Wittemann-Lewis is a simple one. Prior to November, 1917, they came before the Production Board with what at that time seemed to be a small plant with a small organization, conducted by known expert engineers—for no one can say that the Wittemann brothers are not versed in the science of airplane design and construction. During that period it is my contention, and that they should have gotten some sort of order, no matter how small—enough to give these men incentive to make their ingenuity useful in the future development of this field, for if the Production Board has ever contended that they were not production men, there was something out of the hundreds of millions of dollars of work that the Production Board had for this purpose that the Wittemann-Lewis people could have done in order to benefit both the country and themselves.

But they have not received anything, though they were offered something verbally, which evidence proves it would have been impossible for them to accept, inasmuch as it was tied up with conditions brought about by the connection with the Curtiss Co., which no sane manufacturer of airplanes would undertake.

But let us forget the fact that they have been neglected prior to November, 1917, for a period of 10 months, during which time many people who have never built airplanes, nor knew a thing about airplanes, have received contracts—and go to the period after November, when we were called in by certain bankers of New York to investigate the Wittemann-Lewis Aircraft Co. and pass upon their ability to handle a Government contract.

We found them so far as plant and equipment are concerned quite small, not warranting a large contract, but we did find them well-versed men in the understanding of what an airplane should be. We were therefore retained as production and managing engineers and we subsequently wrote a report covering production planning for an enlargement of the Wittemann-Lewis Aircraft Co. through capital to be provided by the bankers in question and where the Wittemanns would act as aircraft engineer with out concern as production engineers and managers. This was repeatedly brought to the attention of those in operation of the procurement department. As a matter of fact a similar report to that which had been submitted to the bankers was left with this department of the Aircraft Board. But nothing seems to have availed. Two things were discovered months thereafter: One that the report was left in the hands of a new man who just happened to come into the department for a few weeks, and is out belief that that report has never been read by anyone else excepting that new man; second, we were told only recently that the report was lost in transit between Washington and Cleveland and we were requested for another one.

With a situation of that sort there is naturally a feeling of great disappointment. The small manufacturer is used to expecting the least for the greatest amount of effort, but it is not so with those who like ourselves are investigating and managing engineers where we come in contact with difficult industrial problems and where always a solution is found if the problem is studied, analyzed, and planned in advance.

carefully. I wish to convey to you this point, when we were brought into the Wittemann-Lewis Aircraft Co. we never expected to be a party to the getting of a contract, but we became interested only after we saw what little chance people of the type of Wittemann-Lewis have in obtaining proper treatment.

It has come to our attention at various times that the contract or production department of the Aircraft Board contended—

(1) That the Wittemann-Lewis Aircraft Co. were offered contracts but they have not responded.

(2) That they were too small and were not production engineers.

We will answer for the benefit of the Production Board that in regard to the first we are witnesses that persistent effort has been made to receive attention and that it must be denied that any offers were made to them where they have not responded, excepting in the case of the original verbal offer which they refused on account of the Curtiss interference, as explained to you in the letter to Mr. Bezner, and it was fully and repeatedly explained to the same people who have power to let contracts, but without avail.

In regard to the second, we have already agreed that they are small, and while they are expert designers of airplanes, they have taken the proper course when they engaged us to cooperate with them in the problem of large production. As a matter of fact, the Government in other departments that I know has considered very seriously that it is not really a question of plant or equipment in producing war devices, but it is the knowledge of the art, and organization.

It will take very little investigation to find out how many concerns have been financed by the Government because of knowledge and organization, and it is my firm belief that the Aircraft Production Board would have made no mistake if the Wittemann-Lewis Aircraft Co. had not only been given a contract, but had been also financed.

For five months they offered everything that the Government could wish, but nothing has come of all this. So that when a situation like this arises, it is my belief that it is no longer up to those having charge of the letting of contracts to handle the matter, but it surely comes up to the man at the head of the Aircraft Board. The Wittemann-Lewis situation has been aired so much that I am surprised that it has not reached you earlier than this.

All this goes to prove that this concern has not been treated right. However, at no time did we come out to say that such was our view, nor have the Wittemann-Lewis people openly expressed their feelings in the matter. All that has been said or heard regarding the Wittemann-Lewis Co. has come from the indignation of many outside disinterested people, who say things as they are, and not from talking. However, when reviewing this whole history of the Wittemann-Lewis Aircraft Co., which should have been the one to receive an order, one can not remain quiet nor at peace. Our attitude up to this time was rather one of disappointment and silence, for the reason that we did not believe in embarrassing so tremendous an undertaking as the one which you are the chairman.

Very truly,

The CHAIRMAN. Mr. Wittemann, were you originally requested and did you originally consent to identify yourself with the organization of what is called the Aircraft Manufacturing Association?

Mr. WITTEMANN. We were put on the list. We originally consented; yes, sir. We were put on the list subject to the terms and conditions and other requirements that may eventually be made upon the member.

The CHAIRMAN. Did you continue to occupy that position or did you withdraw from the original list?

Mr. WITTEMAN. We occupied that position until the by-laws had been drawn. There is one clause which states that any eligible member must have had either \$100,000 of business in the past year or have that amount of business at the present time. I believe those are approximately the terms of it.

The CHAIRMAN. You could not comply with that provision?

Mr. WITTEMANN. No, sir. The question was asked as to whether or not we would still be eligible. They stated that we were not.

The CHAIRMAN. In other words; the little fellows were to be excluded?

Mr. WITTEMAN. At that time we were one of the big fellows.

The CHAIRMAN. At that time was any reference made to this letter of Mr. Avram's by Mr. Potter in April, when you called upon him?

Mr. WITTEMANN. Mr. Potter just had it on his desk. Col. Horner said that letters such as these might better remain unwritten.

The CHAIRMAN. Did he exhibit any feeling over that?

Mr. WITTEMANN. He was very much disturbed at our attitude, and made that statement.

The CHAIRMAN. What reply did you make to that?

Mr. WITTEMANN. After each man had argued it, I said, "If you leave the sarcastic part out and take the facts as they are, they are correct, are they not?" He said, "Yes, sir."

The CHAIRMAN. At any rate, Mr. Potter did not use or refer to that letter as any reason why you should not have a contract?

Mr. WITTEMANN. No, sir.

The CHAIRMAN. I think that is all.

(Thereupon, at 4 o'clock p. m., the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

SATURDAY, JULY 20, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10.30 o'clock a. m., in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MAJ. GEN. WILLIAM L. KENLY.

The CHAIRMAN. Gen. Kenly, as you know, we have been appointed by the Committee on Military Affairs to inquire into the conditions regarding aviation, principally as regards production. We have heard a great many gentlemen, and we have traveled some and had first view of some factories and have seen with our own eyes some of the facilities for production, and we are just about through. Our program contemplated the completion of our investigation and then the making of a report in crude form, and before submitting it to the committee we thought we would submit it to you and Mr. Ryan for the purpose of getting such information from you as we could regarding the changed conditions since you have taken hold, as that would materially affect the report. Only yesterday we learned that both you and Mr. Ryan are going away and were to be gone for something like three weeks, which explains the reason for our asking you to attend to-day and on account of which we are not ready to present any report, because we have not formulated one as yet. We would like to get from you before you go away a statement as to what has been done with regard to matters of inspection, changed conditions in training, if any, and other changes that have been instituted since you were put in charge of the Bureau of Military Aeronautics. We think that you may have anticipated, and probably have set in force, changes and made recommendations, and it would give our committee pleasure to say that these things have already been done. I think that is a brief outline of the reasons we had for asking you to attend this meeting.

Gen. KENLY. First of all, sir, I found the organization turned over to me in Washington rather messed up, and there was really very little real organization. I think we are beginning to see a little daylight now. I have changed some of the heads of my bureaus and have gotten hold of some additional men who are now with me.

There is one man in particular, who was sent to Europe and whom I have since had sent back, Col. Kenney, who has been of a tremendous amount of service in bringing about a systematic organization within my own office. That was extremely necessary. Even now we have not got things going quite the way we wish.

Up to the time I took hold there seemed to be an idea that each department was more or less independent. They were acting upon that supposition. There was much overlapping, and naturally much ignorance in one department about what another department was doing. There was considerable authority exercised by subordinates who signed important documents by authority of the Chief Signal Officer. Of course it takes some time to discover that many of these things have been going on, because you would hardly suspect them until you run into them. That seemed to be one of the most necessary things to do when I started out.

When I first came back I took a look around through the Texas schools before I had any real idea what they wanted to do with me.

The CHAIRMAN. Do you mean preliminary schools, like the Princeton School?

Gen. KENLY. That type, including flying schools. I saw all the preliminary, primary training, and pursuit schools and the gunnery schools. I saw the command of the British cooperative training at Fort Worth, the observers' school at Fort Sill, the balloon school at Omaha, and I also saw the Belleville school. In that inspection I also saw the ground school at Austin. So I got some idea of how things were going on.

I was quite impressed by the excellent work that was being done along certain lines. The primary training and the advanced training, so far as facilities were afforded, were being very well done. I thought.

The construction work at these schools, one and two unit schools—the actual plant costing something like from \$2,000,000 to \$5,000,000—impressed me as having been especially well done, especially in view of the fact that so much had been accomplished in a comparatively short time. However, there was quite a lack of coordination.

One school would be accentuating one thing and another another thing. After they put me in charge I attempted to standardize training and to cut down excessive flying for some schools, and to do everything possible to impress on everybody the necessity of so handling training that accidents would be cut down to a minimum.

That is a practice which I have tried to follow consistently. Several weeks ago, when I felt that it could be done, I directed that all standard training planes, so called, with the four-cylinder Hall-Scott motor be put out of commission. From my own personal knowledge, from what I saw at these schools and from inquiry, I considered this not only an extremely dangerous plane to fly, but also an extremely uneconomical plane.

The CHAIRMAN. How many were there?

Gen. KENLY. That, sir, I would have to look up. I know the value of those was reported to be about \$6,000,000.

The CHAIRMAN. I think it was stated by Col. Arnold that there were about 1,200.

Gen. KENLY. Yes.

Senator REED. Was that the value of the planes with the engine or without the engine?

Gen. KENLY. That is the total. I happen to know the money value, because that was a feature that I felt that some day might invite criticism. I felt that the sudden discontinuance of the use of about \$6,000,000 worth of Government property might be considered a cause for criticism. There has been a necessity for the use of the planes up to that time, as I saw it, because we did not have the Curtiss plane of a more reliable and more satisfactory type to really do the work, so we had to use this plane.

Senator REED. Will you please state the reasons why you considered that plane dangerous and undesirable?

Gen. KENLY. I considered it dangerous, sir, because we had not only quite a number of accidents, actual crashes and deaths, but it had developed imperfections.

Senator REED. Were the accidents and deaths due to the imperfections of the machine or the imperfections of the motor?

Gen. KENLY. Due, sir, to the unreliability of the motor, I should say. The motor was found to be most uncertain. They were always breaking down. They were considered by every flyer with whom I discussed this matter to be so uncertain that in their training and in their so-called cross-country flights they usually flew round and round the field, expecting the motor to go bad, and desiring to be in a position where they could make a safe landing.

The thing that particularly forced the issue was that the day before we reached a decision, as I remember it, there were two deaths from burning in the air. Altogether, as I remember it, there were seven casualties by burning in the air from this type of plane. The one thing that an aviator dreads is fire in the air. If they have no confidence in a plane, that, in itself, is a sort of reason for accidents. So I took this rather important step by wire. I wired everybody that they should discontinue the use of those planes. I felt I could do it, because, due to the slowing down of production according to the original program, it occurred to me that we could begin slowing down on training, and while I held it up for a while we could secure more training planes and more advanced planes, so that the possibility of sending pilots overseas would not be interfered with.

Senator REED. When did this change occur which resulted in the slowing down of production?

Gen. KENLY. That had all happened in the very beginning, you might say, of our entry into the war. The French contract practically fell down, as you know. We expected to supply a certain number of planes to our troops in France from contracts with the French. I was in France when those contracts were materially altered, if not entirely changed. I think the original idea was to accept about one-fourth of the contract rather than the total number. It was due to what I consider two reasons. In the first place, the contracts with the French were dependent upon a certain amount of raw material that was to be furnished by us, and we did not live up to our side of the agreement. In the second place, the increase in German activities in the air caused a change of program in French aviation construction, desirable from their point of view. In other words, they had an increased need for planes which they had not contemplated when the contracts were made. Due to this,

and perhaps to other and political reasons of which I am ignorant, our French contracts fell down so that we became more or less dependent upon what could be done on this side. When I came here I found the situation as I have set it forth.

The CHAIRMAN. Coming back to the question of training planes, do you know whether it would be possible to equip them with some more satisfactory type of engine?

Gen. KENLY. That is a question which is being carefully investigated at this time. I have an idea that the four-cylinder Hall Scott motor can be modified so that it can be used with safety.

The CHAIRMAN. Or you can use another engine?

Gen. KENLY. I am positive that one or the other of these things can be done, so that I consider that a suspension.

The CHAIRMAN. Have you noticed whether the discarding of that type of planes has had any effect upon the average number of accidents?

Gen. KENLY. I can not say that it has. Accidents are due primarily to one thing, and that is the carelessness of the flyer. You hear practically every day of tail spins, nose dives, and side slips. Those things are usually due to the stalling of the machine. They are usually due to the stalling of the machine in an attempt to climb at too steep an angle, or gliding down at too flat an angle, or making a turn at too flat a slope without sufficient power. All of those things are rubbed into the men in training from the very beginning. The moment a man puts himself into the cockpit he knows all these things, and they have been impressed upon him before he is turned loose, and is dependent upon himself. If a man is careless and does not watch the climbing speed of the propeller, it is a very easy matter to stall his machine. If that stall occurs within three or four hundred feet of the ground it is apt to prove dangerous. When the engine stalls flying speed is lost and the plane drops by gravity. When it drops it goes into some variety of spin. It is almost sure not to drop straight. If you get into a spin it takes a certain amount of speed and distance in order to enable you to make the machine respond to control again. Within several hundred feet of the ground that is practically impossible. Most of our deaths are due to the causes I have mentioned.

The CHAIRMAN. The most frequent fires in the air, resulting in the burning of the aviators, resulted in that type of machine which you have discarded?

Gen. KENLY. Yes, sir. I do not think we have had any fires in the air since that, to the best of my recollection, although there are so-called fires because after the machine crashes it is very likely to catch on fire, just as an automobile is.

The CHAIRMAN. That is generally where it strikes the ground?

Gen. KENLY. Yes, sir; where it strikes the ground. We have had a number of fires of that kind, due to the crash itself.

Senator New. You spoke a while ago of the failure of the French to supply the number of machines that we had expected to get from them, or that they had promised. You said that was because we did not live up to our side of the contract.

Gen. KENLY. That was one of the contributing factors, sir.

Senator New. That was one of the contributing factors?

Gen. KENLY. Yes, sir.

Senator NEW. Just what do you mean by that? Do you mean that we did not supply the raw materials with which the French expected to make the planes?

Gen. KENLY. Yes, sir. That was my understanding. That is purely my opinion, because at the time this thing occurred I was no longer connected with the air service. I picked it up from Col. Bolling, who was intimately associated with that phase of it in connection with the contracts themselves.

Senator NEW. Much has been said to the effect that we were to supply quantities of raw materials to the French and that they were to supply our needs with the finished planes out of the material we were sending, and with the aid of the mechanics whom we were sending over there.

Gen. KENLY. Yes, sir.

Senator NEW. In view of that, your statement that they had failed in their program because we did not live up to our side of the contract interested me.

Gen. KENLY. If you will allow me to interrupt you, sir, I think that is one of the contributing factors. Here is another factor which I did not mention, and on which they laid the greatest weight. They said we have good pilots to fly the planes and we need them, and you have not got the pilots; therefore, why should we not be permitted to cancel these contracts? I do not know whether they were canceled or whether they were just redrawn for a much lower number of planes than the original contracts called for.

Senator NEW. In answer to that, it has been testified by officers of your department in the course of our examinations here that we have pilots far in excess of our supply of machines.

Gen. KENLY. We have now, sir.

Senator NEW. We started with a program of pilots that called for 23,000 machines, that number being about the number originally promised for this particular time, July, 1918. Now, the testimony given us is that the Army made ready the number of pilots all right, but the supply of machines was not forthcoming, and that is the reason we have now so many more pilots than can be equipped with flying apparatus.

Gen. KENLY. But you must remember that many of those pilots still are only partially trained. They are trained in primary work only, because to do advanced work requires advanced machines, which even now we are not getting.

Senator NEW. The fact that they have not finished their courses is due to the additional fact that we have not had machines with which to finish them?

Gen. KENLY. Absolutely; yes, sir.

Senator NEW. In other words, they have been taken as far as they could be taken with the outfit that we have available for their training?

Gen. KENLY. Yes, sir.

The CHAIRMAN. What, if any, changes have been made, or what, if any, improvements have been made in the matter of inspection of these camps; I mean the inspection of machines, etc.?

Gen. KENLY. Do you mean so far as production goes?

The CHAIRMAN. No.

Gen. KENLY. You mean so far as training goes?

The CHAIRMAN. My question has reference exclusively to the camps, keeping them in order, and so on.

Gen. KENLY. We have attempted, sir, to improve the engineering section at all camps. That has been a matter that I have given special attention to with a view to coordination, which will make the camps standard so far as possible.

Instructions have always been issued to the effect that no plane shall go into the air that has not been carefully gone over by its crew and tested and O. K.'d by the engineering people who handle that before it is brought out of the shed to fly in the morning. In addition to that, every time a man flies a machine he himself is required to make a careful inspection. Of course, it is superficial, but it is a careful inspection. He must inspect every joint, every turn-buckle, see that the control works, and that the nuts and bolts are in proper shape, and all that sort of thing. That is a part of the regular routine. That has been insisted upon ever since I have known about the Aviation Service. Ours, by the way, is the only one that does that. Abroad they trust entirely to the mechanics.

The CHAIRMAN. You mean our Government?

Gen. KENLY. I mean this: Take a Frenchman, for instance, he will have a mechanic who stays with him. Take Guynimer, he had a mechanic in whom he had absolute confidence. If the mechanic said that the ship was all right, he would get in it without looking at it. On the other hand, our men are required to inspect the planes themselves.

The CHAIRMAN. Are these requirements carried out?

Gen. KENLY. They are rigidly carried out. I do not think there is any accident that can be attributed to failure of inspection.

Senator NEW. I would like now to take up another line. General, you are at the head of the Aviation Department, I know, but you are also a practical flyer, are you not?

Gen. KENLY. A very modest one. I have done some flying. I was at the school at San Diego, Cal., for six months. I was flying all the time, but was only under instructions about three weeks before I came away from there, officially.

I have been flying from that time to this every time I get an opportunity.

Senator NEW. You have given particular thought and attention to the matter of aviation for some time before you were made head of the department; that is true, is it not?

Gen. KENLY. Yes, sir; that is true.

Senator NEW. I want to ask you what types of airplanes we should have made in this country; what type should we now put in production?

The CHAIRMAN. Just a moment, Senator. You mean fighting or training planes, or both?

Senator NEW. I am speaking of combat planes.

Gen. KENLY. I think that is a very difficult thing to answer, Senator, because I do not believe two men in the world would agree on that. We are putting, or we started to put into production, what I thought were, theoretically, if they had come up to the performance of the type they were supposed to represent, as good planes as you could find. The DH 4 of that type, due to its performance abroad, seemed to be an excellent machine in every respect, and the head of

that type. The Bristol fighter the same way. The same applies to the SE 5. The DH 4 is coming along, sir, but it is not yet up to the performance of the British DeHaviland 4, in speed or in various other points. As to the SE 5, we have not started to get it into production at all, but it should be and is, theoretically, an excellent type of machine.

Senator NEW. Now, you are speaking of the DeHaviland 4. Do you regard it, as produced in this country, as a first-class plane?

Gen. KENLY. Right at this minute, no, sir; I do not, but I think it will be. I think we will make it so.

Senator NEW. You think we will make it so?

Gen. KENLY. I think it is gradually getting so, and it will be gradually getting so without really slowing up production, which is an important point to consider.

Senator NEW. To what particular purpose is the De Haviland 4 best adapted?

Gen. KENLY. It is best adapted to day bombing and reconnoissance work.

Senator NEW. Does it carry as high a load of bombs and explosives as other machines of similar type which are now in general use?

Gen. KENLY. I should say so; yes, sir.

Senator NEW. How is it as an observation plane?

Gen. KENLY. As an observation plant I think it has more power, and therefore it is more expensive than is really necessary. It can be used, however, for that purpose.

Senator NEW. General, it has come to the notice of this committee that a short time ago Gen. Pershing sent a cablegram requesting that no more De Haviland 4's be sent over until they had been inspected in this country, or, rather, had been tested in this country.

Gen. KENLY. Yes, sir.

Senator NEW. Is that correct?

Gen. KENLY. I remember that cable; yes, sir.

Senator NEW. There was such a cable?

Gen. KENLY. Yes, sir.

Senator NEW. Will you give the committee a description of the general character of the cable message?

Gen. KENLY. I do not think, sir, that I could give you the details. I do not remember whether that was the cable that had a long list of defects found in the De Haviland 4. If that is the one you refer to, I remember that, in a general way, it went through the De Haviland 4 plane from top to bottom, finding a great many faults. Many of these, however, had already been corrected, or were being corrected, and many of them were really more or less trifling. The cable produced the impression of there being a much more serious condition found than really existed, in my mind. There were one or two important things and many very unimportant things. Attempts had been made before that to correct all these things, or most of them, which had been called to the attention of the production department by our department, and they had begun to make alterations along the lines suggested long before this cable came.

The CHAIRMAN. Is it not a fact that your department preferred to withhold for the time first 75 or 100 De Havilands produced for the purpose of testing them out here, in order to discover whatever de-

fects might be revealed, but that, due to the insistence of the authorities across the seas, they were sent over as soon as they were built?

Gen. KENLY. That is my understanding of it; yes, sir.

The CHAIRMAN. So that the plan which you wanted to follow here would probably have revealed these defects if you had been permitted to carry it out?

Gen. KENLY. Yes, sir.

Senator NEW. Have we built any airplanes in this country for service at the front other than the De Haviland 4?

Gen. KENLY. I believe, sir, that I can say safely that none have been shipped overseas, if they have been built, but I think none have been built. The Bristol fighter, of which they have built quite a number, has not been shipped overseas.

Senator NEW. The United States Government did adopt the Bristol fighter as one of its machines for production, I believe?

Gen. KENLY. Yes, sir.

Senator NEW. That was being made at the Curtiss plant in Buffalo: isn't that the fact?

Gen. KENLY. Yes, sir.

Senator NEW. General, is it true that a board of officers from the Signal Corps went by official direction to Buffalo within the last week to inspect and report on the conditions with reference to the Bristol fighter?

Gen. KENLY. That is true. There was a board sent by me, at the request of Mr. Ryan, and they have been back a week.

Senator NEW. Did it make such a report?

Gen. KENLY. I have never seen an official report, but Maj. Jones, who was a member of that board, told me upon his return that the board had recommended the discontinuance of the production of the Bristol fighter.

Mr. Potter, I think it was, told me that he had informed the Secretary of War, and I believe yesterday, due to the report of this board, they had decided absolutely to discontinue further production of the Bristol fighter.

Senator NEW. To what do you attribute our lack of success in copying the Bristol fighter?

Gen. KENLY. I think, sir, that it is the result of the desire of the production people to turn out something which they thought would fly, without consulting experienced aeronautical engineers who could have told them that it was an impossible situation.

Senator NEW. In other words, the designers of that machine and those who were familiar with it were not consulted about the changes that were made at the factories; is that the truth?

Gen. KENLY. That would be the only reasonable deduction I could make, sir.

Senator NEW. I will say here that the testimony of other officers of the department has been to the effect that the weight of that machine was so increased at the factory that whereas it had been originally designed to carry a wing load of 7.1, it had been forced to carry a wing load of 9.2, which was entirely too heavy a load and rendered the machine unsuitable, unstable, and dangerous. You confirm that opinion?

Gen. KENLY. That is my understanding, purely from hearsay, however.

Senator REED. That is the result of your investigation?

Gen. KENLY. Yes, sir; without having seen the report of the board, except being told by Col. Jones that the board had said it was unsuited to do anything with, even if you stripped it; that it was not fitted to be used as a training plane because it had too great weight per square foot of wing surface.

Senator NEW. Then the Bristol fighter is to be entirely abandoned?

Gen. KENLY. That is my understanding; that it had been recommended to the Secretary of War to entirely abandon it.

Senator NEW. Can you tell us how many planes had been completed?

Gen. KENLY. I do not know that.

Senator REED. Can you tell us from your records the amount of money which has been expended in producing the Bristol fighter, not only the completed machines, but including the whole Bristol fighter program. I mean to include in that any money that has been employed for any purpose in order to produce these machines. Include the number of machines completed, the number of uncompleted machines, and the amount of material that may have been so used as to not be available for other work. In other words, I want the loss incident to this transaction.

The CHAIRMAN. May I suggest that as Gen. Kenly is going away to-night, I can probably get that information from the department?

Gen. KENLY. If you will allow me to say so, I can get that, but that is a question of production. Mr. Ryan has all that data. He is responsible for all these things.

Senator NEW. Have we developed or copied a successful single-seater machine for fighting?

Gen. KENLY. I do not believe we have, sir.

Senator NEW. How about the Spad? What is your estimate of that machine?

Gen. KENLY. The Spad, so far as I know, is still one of the best single-seater fighters on the western front.

Senator NEW. It is still in use by the French?

Gen. KENLY. Yes, sir. We have one squadron using it. The old Lafayette squadron had the Spad when I came back.

Senator NEW. We, at one time, had the Spad on our program for production, I believe?

Gen. KENLY. Yes, sir.

Senator NEW. Afterwards its manufacture was ordered discontinued, and it was discontinued?

Gen. KENLY. Yes, sir.

Senator NEW. Do you know why?

Gen. KENLY. All I know is, sir, that the cable records show that Gen. Pershing asked that that program be cut out; that the building of the Spad be discontinued.

Senator NEW. I was going to ask you, General, especially about that cable. Do you know whether there is, in fact, a record of the cable having been received by the department from Gen. Pershing in which the Spad is specifically mentioned?

Gen. KENLY. Yes, sir.

Senator NEW. In which he asks that it be cut out?

Gen. KENLY. Yes, sir. I do not know whether we have got it yet or not, but we will furnish you a copy of that cable.

Senator REED. How do you account for that? You say it is a good machine for use on the front?

Gen. KENLY. I do not know exactly how to account for it, unless it is a question of engine production—the particular type for it. I have also understood, without being specifically so informed, or positively assured of it, that it was the idea that we should build rather a big bombing type—a two-seater type—in this country, and be furnished a one seater from overseas, from the French and British, and, possibly, the Italians. I speak with more or less uncertainty. For two months before I came back I had not been near the air service, and many things have transpired during that time that I picked up by hearsay or by digging it out myself, and this Spad situation is one of them.

Senator REED. Have you gone back to making them again?

Gen. KENLY. No, sir.

Senator REED. Are we not making the equivalent of it in the SE5?

Gen. KENLY. Yes, sir. It is practically a two-seater Spad.

Senator REED. We were furnished by the French with a Spad machine—the single-seater machine?

Gen. KENLY. They have equipped more than 1 squadron over there. We have 13 squadrons on the front.

Senator REED. How many men would be in a squadron?

Gen. KENLY. They run from 18 to 21. There are about 3 extra men.

Senator REED. That would mean 21 machines.

Gen. KENLY. The replacement is considerable, you know.

Senator NEW. The replacement of machines or pilots?

Gen. KENLY. It is really pilots. The replacement of machines is an uncertain thing. You may have no replacements and you may have to replace them all in two or three days. It depends upon luck.

Senator REED. That number of machines is, of course, a bagatelle compared with the actual demand?

Gen. KENLY. Yes, sir.

Senator REED. And that does not fill the demand in any way.

Gen. KENLY. No, sir.

Senator REED. Do you know whether we have been promised a large number of these Spad machines?

Gen. KENLY. I could not say.

Senator REED. General, without wanting to press the point importunately, it seems to me a very peculiar thing that there were 2,000 Spads ordered in this country from, I think, one factory, and work had progressed to some extent upon them, if the French had been ready and willing all the time to furnish us those 2,000 machines; secondly, it is very strange that that work was absolutely stopped unless the French had promised us at that time the necessary number of Spads or similar machines; third, it is strange that we find ourselves to-day not making any Spads and not being furnished with any Spads to speak of, and then going over to the SE-5, which is a two-seater instead of a one-seater machine, thus leaving us almost without a one-seater plane.

Gen. KENLY. This other machine has the performance practically of a two-seater Spad.

Senator REED. There ought to be some reason for that situation. I wonder how it is possible to get at it. It seems to me that it is a matter of vital importance.

Senator NEW. General, who should determine the type and character of machines that we are to make and use in our warfare?

Gen. KENLY. It is agreed, sir, that Gen. Pershing shall tell us what he wants. Then I agree with him or disagree with him, and we settle it between us, and then I tell the production division to put such and such a thing into production.

Senator REED. That has only happened since you came in?

Gen. KENLY. Before that I do not know what happened. It has taken quite a lot of talking to agree on that.

Senator NEW. That is a recent development, as Senator Reed has suggested.

Gen. KENLY. Mr. Ryan and I signed that agreement to that effect.

Senator NEW. You said a moment ago that we had 13 squadrons on the front.

Gen. KENLY. The cable advices give that.

Senator NEW. And there are 18 men to the squadron?

Gen. KENLY. That is the normal number, but they usually have 21 flyers.

Senator NEW. That would mean 273 pilots, American pilots, that are on duty on the various fronts?

Gen. KENLY. Yes, sir; approximately that, because there may be 21 in some squadrons, while others may have 20. Eighteen is the minimum.

Senator NEW. That is approximately the figure?

Gen. KENLY. Yes, sir.

Senator REED. How many machines have they got that were made in America?

Gen. KENLY. That have been shipped over?

Senator REED. I mean that they have got.

Gen. KENLY. American flying machines?

Senator REED. Yes.

Gen. KENLY. We have not any advice that they are flying any.

Senator NEW. Has our Army designed service machines, to your knowledge?

Gen. KENLY. To my knowledge, no, sir. There have been training planes designed, but as to the others, I believe not. I can not say absolutely authoritatively about that.

Senator NEW. Now, General, I have one or two more questions to ask. You are the head of the military air service?

Gen. KENLY. Yes, sir.

Senator NEW. What, in your opinion, has been wrong with our system that we have failed to produce more successful service machines?

Gen. KENLY. I think it has been a matter of proper organization and proper direction of that organization by the military head of aviation. I think they would have been further advanced than they now are, although I think the production of airplanes up to the present time, so far as quantity goes, has been very creditable, considering that it has been done within practically one year, if there had been proper organization.

Senator REED. General, what does quantity amount to when you take \$6,000,000 worth of planes of one type and throw them out of use because a lot of gallant fellows have been killed in them? That kind of quantity production is no good.

Gen. KENLY. No.

Senator REED. Take a plane like the Bristol. Many millions of dollars have been lost, and that has been thrown out. That kind of quantity production counts for nothing.

Gen. KENLY. It is worse than nothing.

Senator REED. Yes; it is worse than nothing. Now, as a matter of fact, speaking of quantity, we have not produced in this country yet and put on the front one single-seater fighting plane, have we?

Gen. KENLY. We have not, sir.

Senator REED. We have none under way, so far as you know?

Gen. KENLY. We have not.

Senator REED. And yet that character of plane is used extensively by all of the nations on the battle front?

Gen. KENLY. Yes, sir.

Senator REED. We have not produced in this country a single night bombing machine which is in operation, have we? I mean by that one of the large, heavy type of machines.

Gen. KENLY. There have been two turned out; one was the Handley-Page and the other the Caproni.

Senator REED. They have been recently developed?

Gen. KENLY. Quite recently.

Senator REED. And can hardly be said to be thoroughly tried out in this country?

Gen. KENLY. They are not thoroughly tested; no, sir.

Senator REED. Of course, they have not been to the battle front?

Gen. KENLY. No, sir.

Senator REED. We have not produced a single two-seater fighter that is upon the battle front at this time, have we?

Gen. KENLY. We have not.

Senator REED. The only machine that we have produced and that is upon the battle front, or, I mean, has gotten over there and is at work, is the DeHaviland 4; that is correct, is it not?

Gen. KENLY. That is correct.

Senator REED. And the number of those that have gone across is very small, and their advent upon the western front is very recent; that is correct, is it not?

Gen. KENLY. Yes, sir; that is correct?

Senator REED. In the meantime we have expended all of the Government's \$640,000,000 appropriation which was made in one lump, have we not?

Gen. KENLY. From my recollection of some testimony that I heard on that subject by production before the Military Committee of the House, I should say that we were overobligated for that amount, but as the results of the contracts about two-thirds have been received; that is, they paid out something like \$200,000,000, and the balance would come along in time.

Senator REED. Yes; but in addition to the obligation of the \$640,000,000, you understand, do you not, that there are about \$250,000,000 more of obligations outstanding?

Gen. KENLY. Yes: I understand that.

Senator REED. So that the amount expended or obligated approximates \$1,000,000,000?

Gen. KENLY. That is my understanding.

Senator REED. Now, let us see; we have under way in production, if the Bristol fighter is thrown out, a single two-seater fighting machine, have we?

Gen. KENLY. That is true, sir.

Senator REED. How about the SE 5's? Do you call that a fighting machine?

Gen. KENLY. That would be a fighting machine.

Senator REED. Have they been started in production?

Gen. KENLY. I believe they expect them in October.

Senator REED. So that we may say that is on the way. I want to get it as it is. I do not want to overstate it.

Gen. KENLY. Yes.

Senator REED. Now, General, isn't a great deal of this trouble due to the fact that they have been trying to force one engine into different types of machines, and that that engine itself has been undergoing a process of development and that kind of experiment which must go with every new piece of machinery? Isn't that largely the cause of this situation?

Gen. KENLY. I absolutely believe that is the reason for it.

Senator REED. I want to ask you now your opinion as an expert about this. Should we or not, at the beginning of this war, have selected one or more of each of the most approved types of machines employed by the French, English, or Italians, and have entered upon that production in this country, making as nearly exact copies as possible, and have done that without waiting to develop engines and planes for ourselves, thus making our whole program dependent upon an engine which we might develop?

Gen. KENLY. I believe, sir, if that had been done we would have been very much further forward than we are now.

Senator REED. Is it not known to you—and I ask this, thinking that you may possibly have heard of it—that when Italy entered this war, not being much of an aeroplane-producing country at that time, it did substantially the thing I have suggested in my previous question; that is, sent to France and obtained French experts, French machines, and French drawings, and proceeded at once to the making of machines of that type, and then at about the same time allowed her own engineers to begin the development of Italian machines, carrying along the two programs, one of copying a successful machine abroad and the other of trying to produce one themselves? Do you know about that?

Gen. KENLY. I have understood that was the case.

Senator REED. And the result has been, has it not, that Italy had got herself pretty well supplied with planes pretty early in the contest?

Gen. KENLY. Yes, sir.

Senator REED. You think that should have been done here, do you not? You think that program should have been followed?

Gen. KENLY. I will say I believe if it had been done we would be very much further forward. Of course, there are many considerations entering into these things.

Senator REED. Oh, certainly. There was in this country a factory at the time we entered this war that was engaged in making the Hispano-Suiza engine, was there not?

Gen. KENLY. I can not answer that question.

Senator REED. You can not answer that question?

Gen. KENLY. No, sir; I do not know that, sir.

Senator REED. Is it not a fact that now, after having occupied all these months in the method that they have been described as having been occupied, we are now substantially beginning on the program that has been suggested by my two or three previous questions; that is to say, are we not now beginning to adopt machines, and machines that are to be equipped with other engines than the Liberty engines?

Gen. KENLY. Yes, sir. We are making arrangements to build the Hispano-Suiza motor that you have just spoken of.

Senator REED. What is the arrangement we are entering into with reference to the Hispano-Suiza motor?

Gen. KENLY. I really could not give you definite information on that.

Senator REED. I do not mean the details.

Gen. KENLY. We are building the 150 and the 300 horsepower Hispano-Suiza motors.

Senator REED. In quantity?

Gen. KENLY. In considerable quantity. I do not know to what extent, but it is quite large.

Senator REED. And we are going to put them into what character of machines?

Gen. KENLY. We are using a great many of them, sir, in our J. N. 4 H, so called, which is one of the advanced types of training machines. We are using those very largely.

Senator REED. The 300-horsepower Hispano-Suiza is going to be used in the machine that is expected to fly over the lines, is it not?

Gen. KENLY. That is my understanding.

Senator REED. It would be very well adapted for that, would it not?

Gen. KENLY. It is a very excellent engine, the Hispano-Suiza. I know that myself.

Senator REED. There are some other engines, are there not, that we are now getting ready to produce? Are we not getting ready to produce some of the English engines?

Gen. KENLY. That I am really unable to answer.

The CHAIRMAN. The Le Rhone is in production.

Gen. KENLY. Oh, the Le Rhone is in production. Some of the rotary engines, I know. Some of those rotary engines we have already produced considerable numbers of.

Senator NEW. Can you tell us anything about the character of the contracts under which those engines—the Hispano-Suiza, the Liberties, and the Le Rhones—are to be made? Let me explain that question. We know, of course, the number of Liberty engines that had been contracted for originally. We will say now the same thing with reference to the Hispano-Suizas and the Le Rhones. Now, I understand that orders have been issued for an additional number of engines of each of those types and that contracts for them, while not yet made, are under consideration; and in our investigations it has been developed here that the profits to the manufacturers making

the Liberty motors are in the neighborhood of \$1,100 per motor, and that the profits to the makers of the Le Rhone engines are in excess of \$1,600 per motor. I think I am right in those figures. It is not less than \$1,600 on the Le Rhone motor. Do you know whether anything is being done to make the award of the next contracts at a less cost to the Government than the first one?

Gen. KENLY. I can give you those figures, but I regard this as highly confidential.

(Informal discussion followed, which the reporter was directed not to record.)

Senator NEW. As I remember it, my last question was one in which I asked you what was wrong with our system; that we had failed to produce more successful service machines, and you said, in general terms, you thought it was defective organization. Now, I will ask you, General, if it is not true that under that system of organization or lack of organization, just as you prefer, there has not been much confusion at times that has resulted in misunderstanding and delays?

Gen. KENLY. I am sure of that, sir.

Senator NEW. Has not this occurred also—and I think you made a slight reference to this in your earlier testimony—that cablegrams from Gen. Pershing intended for your department had been received by the production department?

The CHAIRMAN. Senator, all those cables go to the Secretary of War.

Senator NEW. Well, have been referred to the production department and answered by it without reference to your department, resulting in confusion or wrong answers, or answers that were at least unsatisfactory to your department, and generally calculated to mislead both here and abroad?

Gen. KENLY. There have been instances of that, sir. Right now all cables that come that have anything to do with either the production or my department, I see. I also see all copies that go out.

Senator NEW. That, also, is a matter of recent correction, is it not?

Gen. KENLY. Yes, sir. I believe it is comparatively recent.

Senator NEW. Now, to get down to bedrock: This committee, of course, is more interested in building up for the future than it is in criticism of what has passed, or in tearing down just for the sake of tearing down. With that in view, we would like to have any suggestions you may have that you think might be acted upon that would result in bettering our system.

Gen. KENLY. I will tell you, sir, exactly what the relations between Mr. Ryan and myself have been up to date. It became evident at first to me that with an independent head of production and an independent head of operations, which I am—I have no power to direct Mr. Ryan to do anything, nor can he give me any directions—the success of our work would be dependent upon the closest sort of cooperation. To parallel each other we would have to be very, very close, and if we really succeeded, it would be because we were so thoroughly in touch with each other and sincerely desired to cooperate.

The CHAIRMAN. Thoroughly of one mind?

Gen. KENLY. Yes; thoroughly of one mind. Then we might succeed. It is a difficult question. First of all, we came to an agreement. It seemed to be necessary that something of the sort should be done.

The agreement was put in writing, and a copy was sent to the Chief of Staff. The substance of it was that I would tell Mr. Ryan what we wanted in the way of production and he would produce it. We would test it and O. K. it, or suggest modifications, and, finally, we would approve it, and then it would be put into production. When produced it would be turned over to me. In a general way, that was the original agreement. Quite recently, due to all sorts of friction that we found growing up, and a lack of cooperation on the part of subordinates, particularly along technical and engineering lines, we have just agreed to a certain arrangement, and I turned in to the Chief of Staff this morning a document signed by Mr. Ryan and myself to this effect: That we would combine our engineering sections—my technical section and his so-called engineering section—and they would be stationed at Dayton, Ohio, for the present and work together; that a head of that combined section, selected by Mr. Ryan and agreeable to me, would take charge of that combined section, working for both of us, however; that my technical section would report to a liaison technical officer in my office who was closely associated to a similar man in Mr. Ryan's office, so that I would get the operation's point of view from my own man weekly, but everything that came to me was also laid on the table for Mr. Ryan. His man did the same thing with him, and I saw that, and all our communications with the engineering section were sent to Mr. Ryan, and his to me, so that our cards are on the table.

I have instructed my own technical men that they have got to get along harmoniously out there; that it just has to be done. It would seem unnecessary, perhaps, to have to say that, but engineers and men of that type are very hard to get along with.

The CHAIRMAN. And they have a hard time getting along with each other?

Gen. KENLY. Yes, sir. They think their view is right. They are regular prima donnas. In addition to this, we agreed that I should establish a testing section, and that would be exclusively under my control.

The CHAIRMAN. Just one testing section?

Gen. KENLY. Just one testing section, and that is under me. We test and O. K. what he produces. This testing section also is trying to improve production all the time. It was agreed also that we would organize under me an information section, and we would establish agents overseas from whom we would get all the information we possibly could along the lines desired, for our mutual benefit. The Chief of Staff approved the list which I turned in to-day, which will be the beginning of that information process. These things have been agreed to by Mr. Ryan and me and put in writing. We put it in writing so that the Chief of Staff would have something for his files.

The CHAIRMAN. The purpose of the last agreement is to harmonize by unifying the production engineering section and the military engineering section?

Gen. KENLY. Yes, sir.

The CHAIRMAN. Presided over by one man to be selected by Mr. Ryan with your approval?

Gen. KENLY. Yes, sir.

The CHAIRMAN. About how many men constitute that engineering staff, General?

Gen. KENLY. We have about 10 men, and I presume Mr. Ryan has about that many. That, however, is a growing organization, and it may be and will be much larger than that. Of course, that does not include the office forces, draftsmen, and men like that.

The CHAIRMAN. How have you arranged for the increase of this engineering force?

Gen. KENLY. There has been nothing said about that, sir. It is now arranged that anything proposed that Mr. Ryan and I agree to will be automatically done.

The CHAIRMAN. You anticipate no trouble?

Gen. KENLY. I will say that so far as Mr. Ryan and Mr. Potter are concerned, those two men have not shown the slightest indication of anything except a general desire to cooperate.

The CHAIRMAN. I am quite sure of that. Is there any other matter which, in your judgment, can be recommended that will still further improve conditions?

Gen. KENLY. I think, sir, under existing circumstances, that if this plan that we have under way works out all right there will be nothing more to be said right now.

The CHAIRMAN. And if it does not work out all right——

Gen. KENLY. Then something should be done. I have distinct views as to what might have been done to begin with, but I think we may get along all right this way.

The CHAIRMAN. In that connection, I would like to get your opinion of the policy or expediency of the establishment of a separate department of aeronautics, distinct from, and yet cooperating with, the Navy and War Departments.

Gen. KENLY. I believe, sir, it would be a very wise thing to do. It is a specialized arm of growing importance. I think the biggest thing in aviation that has been done has been the point of view taken by Great Britain.

The CHAIRMAN. That would contemplate an additional Cabinet officer representing the air service. I think the British call him the air minister.

Gen. KENLY. Yes, sir; it requires specialized study, because a man can not think of it casually and make the most of it. I think the British are on the right track.

The CHAIRMAN. While we are on this subject, please tell the committee whether there is any conflict or friction between the War Division of Aeronautics and the Navy Division of Aeronautics.

Gen. KENLY. There is no real friction, but there is a very strong feeling that the Navy is sometimes getting more than its share. They naturally want to get all they can. Before we met I mentioned, for instance, North Island, at San Diego.

Senator NEW. The Navy not only wants to get all they can, but they succeed in getting it, do they not?

Gen. KENLY. I feel rather keenly about it, because I went through the school out there when the Army had it alone. The Army had developed this alone under great difficulties. It was a question of acquiring that land from Mr. Spreckels when I was out there, and it was going to cost a lot of money. We had not entered the war. It was very desirable to have the Army own this and not be dependent upon the benevolence, so to speak, of Mr. Spreckels, because up to that time the Government had never paid a cent for it, nor had

the Government paid taxes on the land. In the desire to acquire it, somebody proposed the cooperation of the Navy, and the Army and Navy combined—I assume this, because I left there and went overseas—and they finally acquired the land, and now the Navy is gradually shoving the Army out. They have all the land and buildings put up by the Army, and the Army is being pushed on the other side of the island. The Navy has all the water front, the sea front, and there is no doubt that it should be exclusively handled by the Army or the Navy. When I come back I shall have a definite recommendation to make as to whether one or the other shall have it. That is one thing that could be settled if one man had to handle it. The Secretary of the Navy now will say, "We should have it." And the Secretary of War will say, "We should have it." Who is going to decide without friction?

(Informal discussion.)

Senator REED. You were speaking a while ago of the different types of engines that are now being made, and the fact that we are finally coming to the point of making foreign planes and foreign engines and putting them together and proceeding to make some of them in this country. We have been speaking also of our failure up to date to get any real fighting planes. What is your program, General, in order to get these planes in quantity and of the character that we desire and need?

Gen. KENLY. We are following now, sir, absolutely the overseas program; that is, Gen. Pershing's request of an O. K. by the Chief of Staff and the production of the De Haviland 4. The Bristol fighter has been discontinued, as I have said, and we have already referred to the S. E. 5. That is all they are contemplating at the present time.

Senator REED. In the meantime what becomes of these immense factories that have been devoted to the airplane business?

Gen. KENLY. They are still building a certain number of training planes, and they are supposed to switch to the other planes that are approved and that will be in production.

Senator REED. Those are the ones just mentioned—the De Haviland 4, the S. E. 5, and what other machines?

Gen. KENLY. There are various advanced training machines that have to be, as the program goes along, constantly replaced, and there are the bombing, observation, pursuit, and M defense machines.

Senator REED. Those are advanced training planes?

Gen. KENLY. Yes, sir; those are advanced training planes. Just at the present time we have a very small number, an insufficient number.

Senator REED. At the present time?

Gen. KENLY. At the present time; yes, sir.

Senator REED. As a matter of fact, while they may not be sufficient to complete the program, the necessity for them is not anything like as great as it is for the fighting planes on the front?

Gen. KENLY. No.

Senator REED. Now, what I am trying to get at is, What is the program with reference to the fighting planes on the front? As I understand it, nothing besides the S. E. 5 and the D. H. 4 have been determined upon?

Gen. KENLY. And the Handley-Page and the Caproni.

Senator REED. The Handley-Page and the Caproni have been ordered in some quantities?

Gen. KENLY. Yes, sir.

Senator REED. They have?

Gen. KENLY. Yes. Then there is the D. H. 9 and also the D. H. 10, which may be modified without holding up production.

Senator REED. What will we have to take the place of the discontinued Bristol fighter?

Gen. KENLY. That is a thing to be determined at once, sir. We have not been officially notified beyond what I told you is my unofficial notification. That has got to be replaced very quickly by something that is satisfactory to Gen. Pershing. The program of production over here so far has been one that he has had a guiding hand in, the supposition being, or the claim being, that they want quantity production over here of things that can not be produced satisfactorily over there. We want two-seater machines. They say they can furnish us with one-seaters. As a matter of fact, we can not have too many of them.

Senator REED. As a matter of fact, they have not been furnished.

Gen. KENLY. No, sir.

Senator REED. As a matter of fact, as was testified the other day by a young officer sent over there on the business of inspecting and finding out these things, the planes we are using over there of English and French make are an inferior class of machine?

Gen. KENLY. They are, except a few Spads.

Senator REED. Why isn't it a proper thing to make those Spad machines and get them out in quantity?

Gen. KENLY. If I were chief of the Air Service in both France and here, I would decide that matter myself; but as it is, Gen. Pershing asks for something, and it is approved by the General Staff. That is the program that is being pursued up to the present time.

Senator REED. The fact of the matter is it is all a mixed-up jumble?

Gen. KENLY. Yes, sir. If you could look over the cables that I have, you would find a cable from overseas asks for one thing one day and the next day countermands the order, and then the next day asks for it again, and a week later again countermands it. It is entirely a jumble.

Senator REED. A thing that should be gotten at.

Gen. KENLY. Yes, sir; if we are going to get out of it. They have recently appointed a chief of air service. It is expected that he will do something. He is Gen. Patrick.

Senator REED. As a matter of fact, we have spoken of 273 planes with flyers on the front with the Army. We now have an Army of 1,200,000 men. How many planes should we have?

Gen. KENLY. I would have to figure that up. The program calls for 350 squadrons by next year. The original project contemplated two armies by next summer. We have one there now. We ought to have about 175 squadrons instead of 13. That is what we would like to have.

Senator REED. I am talking about the proper equipment.

Gen. KENLY. Yes.

Senator REED. That would be about 175 times 20?

Gen. KENLY. Yes.

Senator REED. So that we ought to have about 3,500 instead of 273?

Gen. KENLY. We have got men there.

Senator REED. You are up on the man program, but back on the machine program?

Gen. KENLY. Yes. We are really ahead on the man program. We have about that many pilots on the other side now—over 3,000 pilots now.

Senator REED. I want to ask you about this: You seemed to agree to the proposition that the right thing to do was to take a good English machine and reproduce it, or a good French machine and reproduce it, or a good Italian machine and reproduce it, and in the meantime carry along our own efforts to make our own engines and, perhaps, our own planes. Now, we have started into the manufacture of the Caproni. Why is it that the experts sent here from Italy are not given charge of the production of the very machine that they were sent here to teach us how to make?

Gen. KENLY. I understand that they are supervising it, just as the English are supervising the production of the Handley-Page, but the labor and all that sort of thing is American.

Senator REED. I want to draw a distinction between your statement, if I can, and what I understand is the case. I am going to put it in just as a plain statement of facts. I understand that representatives of the American Government saw Mr. Caproni and expressed the desire that he should furnish or help put this Government in a way to produce a Caproni machine. He sent the superintendent of his factory and a great number of his finest experts over here in order to help us get these machines and get them very promptly. These men have been sent from place to place, and they are now practically marooned out here on Long Island. The production of their machine is going on, but instead of their being put in charge of the work they are at best used in some sort of a minor capacity. I am suggesting this, not by way of criticism, but with the thought that it seems to me to be a bad arrangement, and I know that it is very disappointing to those officers, even heartbreaking to them.

Gen. KENLY. The men that I have seen at Long Island have apparently been more interested in flying the Caproni they had up there than anything else. They were interested in that side of it. The men were pilots.

Senator REED. I am speaking of such men as Capt. D'Annunzio. He expressed the sentiment to me that I have just expressed to you.

Gen. KENLY. That is a thing, being purely production, that I never had presented to me before, and therefore I have really never given it consideration, but I will give it consideration.

(Informal discussion occurred.)

Senator REED. There have been complaints of improper inspection at the factories. There has been some claim that the factories, in some instances, are trying to put off inferior work, and that the inspectors of the Government have not caught it. Do you have charge of that work?

Gen. KENLY. No, sir. We inspect the finished product, but not any part of the production.

Senator REED. Mr. Chairman, if you will permit me to make a suggestion, I think we should send Gen. Kenly all of this evidence, and particularly a marked copy of this testimony with reference to im-

proper inspection, so that he can have it before him when it is sent for revision.

The CHAIRMAN. Is it not a fact, General, that you and Mr. Ryan have arranged for a thorough revolution in the methods of inspection to be put into operation as fast as possible, which has for its fundamental basis the employment of only such inspectors as are sufficiently well acquainted with the things they inspect to make them themselves?

Gen. KENLY. That is absolutely the fact.

The CHAIRMAN. Or are so thoroughly posted in the character and quality of material as to be able to detect anything that was wrong?

Gen. KENLY. I was assured by Mr. Ryan that every inspector would be an expert at the thing he inspected.

(Informal discussion occurred.)

Senator REED. I want to ask a question along this same line. Do you think that a proper inspection of the merits of a machine is likely to result when one of the makers of that machine is in charge of production and another one of the makers of that machine is in charge of the final test?

Gen. KENLY. Do you mean maker or designer?

Senator REED. Designer. Do you think that is the best way to get good results?

Gen. KENLY. No, sir; I do not think so.

Senator REED. I call your attention to the fact that Col. Hall and Col. Vincent are credited with having designed the Liberty motor. I apprehend that, like all other machines, the designs of many other men are wrought into it, but they, together, chiefly designed the Liberty motor as we know it. As I understand the situation, Col. Hall has been placed largely in charge of the production of the motor; that is, the inspection of the motor and the installation of the motors in the planes. That, then, when the plane is completed, it goes to the McCook testing field, and when it goes there, it is tested by Col. Vincent, so that the two men who designed the Liberty motor produce it and inspect it.

Gen. KENLY. That does not exist now.

Senator REED. When did that cease?

Gen. KENLY. When they get through producing it they turn it over to me and I test it.

Senator REED. That is very recent, is it not?

Gen. KENLY. I thought that was so axiomatic that there would be no opposition to it, but I found it was not being done. It was being done the way you have stated, and there was considerable opposition to changing it.

Senator REED. When did you change that—about how long ago?

Gen. KENLY. This first agreement in writing between Mr. Ryan and myself is a matter of record.

Senator REED. I do not ask you to be accurate about the exact date.

Gen. KENLY. I should say it has been six or eight weeks ago when we made this agreement, and it has been, possibly, four weeks since we really got the thing going.

Senator REED. As a matter of fact, is Vincent now out of the position that I have referred to over there at McCook field?

Gen. KENLY. I do not know just exactly what kind of testing they do on their own hook, but I test them before they are accepted.

Senator REED. Do you mean that they are individually tested by you?

Gen. KENLY. Oh, no, sir.

Senator REED. Is Hall one of the staff that makes inspections now?

Gen. KENLY. No.

The CHAIRMAN. Is Commander Barry?

Gen. KENLY. The man who is doing that specifically is directly under Col. Bane. Col. Bane is going to be with the rest of the technical men in Dayton, right where the thing is going on. We are interested from the standpoint of the men who are going to use it and fly it, and, therefore, in association with the production engineers Col. Bane and the other men who are particularly interested in my point of view will go right through the factories and satisfy themselves that the factory inspection and production inspection are as they should be. Although that is really under the control of production, we will assure ourselves that the thing is going right, and if it is not going right, Mr. Ryan and I will have to take it up and settle it.

Senator REED. You say you found there was some opposition to changing the conditions that I spoke of. Does that opposition come from any of the manufacturers?

Gen. KENLY. No, sir; it was the opposition of some of Mr. Ryan's subordinates here who had been doing the thing, and therefore they did not like to give it up.

Senator REED. Were they men who formerly had been connected with automobile concerns?

Gen. KENLY. I think not.

Senator REED. Were they Regular Army officers?

Gen. KENLY. No.

Senator REED. Were they dollar-a-year men?

Gen. KENLY. The man I am thinking about is Col. Horner. He is a belligerent sort of man, who does not like to give up anything he has. I do not attribute it to anything more than that. I do not see at present that there is anything to be apprehensive about.

Senator REED. Very well. I think that is one of the chief difficulties.

(Informal discussion occurred.)

Senator REED. Do the flying fields come under you?

Gen. KENLY. Yes, sir.

Senator REED. Are you preparing to locate some new flying fields?

Gen. KENLY. We have no need for them at present. We have a great many tentative sites that are admirably suited, if we have occasion to use them.

Senator NEW. In what parts of the country?

Gen. KENLY. I could not say, except in a general way that they cover all parts of the country.

Senator REED. Do you propose to change the character of the work done at the Wilbur Wright Field so that it will become a testing field?

Gen. KENLY. Yes, sir.

Senator REED. Is that because McCook Field has been found to be inadequate?

Gen. KENLY. No. It was simply so that I could have a place for a testing squadron near enough to one of our big production plants, like

the Dayton Wright people, where, when they turn anything over, we can fly right over there and test it. The field is already in excellent condition.

Senator REED. Why not use McCook Field for that?

Gen. KENLY. There is a certain amount of testing which production has to have. It is preliminary testing with relation to production. That has been under their control. We did not want both. We want one, so we permitted them to hold onto McCook Field without any question at all.

Senator REED. Who wants that—the producers?

Gen. KENLY. The producers.

Senator REED. McCook Field is too small a field for real testing, is it not?

Gen. KENLY. Yes, sir; it is too small a field for real testing. It is too small where you want about 2 miles straight away. The McCook Field will be used by this joint engineering section, from which my men will get equal benefit. They will be located at that field with an experimental laboratory, etc., right at the McCook Field.

Senator REED. What are you going to do if there comes a flood on that Wilbur Wright Field?

Gen. KENLY. In the first place, it will be properly ditched. I understand there has been some expression of doubt about the accuracy of some surveys that I had made by the "floods engineers"—I think they are called out there. I looked into that thing when I was out there. The question of the flooded hangars and all that was looked into. I went down to that office, and I subsequently got a contour map of that field. According to that map, the very lowest point on any part of the Government holding in the swamp and down there in one corner is something like 10 feet above the main creek bottom. I was told by Maj. Wilburn, commander of the field, that there were many portions of the field that were as low as the creek bottom, and very little higher. This contour map did not show that. It ran from 10 to 25 or 30 feet. But, in the event of flood, the way it is now, sir, the whole thing would be under water in an ordinary rain, or a heavy rain. A portion is under flood now because it is not drained properly. However, if this contour map is accurate, the very simplest kind of engineering is involved in properly draining the field.

The CHAIRMAN. It is, however, hardly a field that you would have selected if the selection had been left to you?

Gen. KENLY. No, sir.

Senator REED. I think you had better examine that map. I think it is a perfect maze of swamp.

Gen. KENLY. It is perfectly easy to find out. It can be done in half an hour.

Senator NEW. Gen. Kenly spoke of these contracts which were up before the board the other day. I suggest that we get somebody from up there who can give us the figures on which they are proposing to let the contracts.

Gen. KENLY. Mr. Potter can do that. He can give you every detail. He can give you not only the details in regard to that, but about all matters connected with contracts in connection with production.

Senator NEW. If you can furnish those figures I see no reason why we should summon any other witnesses.

Gen. KENLY. I can not give them to you, sir.

Senator NEW. If you can not, I would like to have those figures from that board.

Gen. KENLY. Contracts and various things of that kind that are proposed are brought before the Aircraft Board for approval. I am a member of that board. They are discussed in a general way, but as to going into them in detail, I have not seen that done.

Senator NEW. Mr. Potter could do it?

Gen. KENLY. Yes, sir.

The CHAIRMAN. I received this morning from Col. Arnold a statement in response to an inquiry which I addressed to him of the number of planes and the types of planes which have been furnished to our squadrons on the front up to this time, making a total of 271. If you do not object, General, I will have this put in the record as a part of your statement.

Gen. KENLY. All right, sir.

(The statement referred to is in the words and figures following to wit:)

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS.
Washington, July 19, 1918.

From: Department of Military Aeronautics.
To: Hon. Charles S. Thomas, Committee on Coast Defense, United States Senate.
Subject: Equipment of American air squadrons at the front.

1. Answering your inquiry regarding the above subject, addressed to Maj. Gen. William L. Kenly, the following is submitted for your information:

From the latest reports from the American Expeditionary Forces, there are at present 13 squadrons at the front, equipped with 271 planes purchased from foreign governments of the following types:

Name.	Type.	Engine.	Deliv- ered.
Breguet XIV B2.....	Bomber.....	Renault, 300 horsepower....	2
Breguet XIV A2.....	Observation..	do.....	2
Sopwith A2.....	do.....	Le Rhone, 120 horsepower...	2
Sopwith B2.....	Bomber.....	Clerget, 120 horsepower.....	2
Spad XI.....	Pursuit.....	Hispano, 220 horsepower....	12
Spad A2.....	Observation..	Gnome, 150 horsepower.....	
Spad 6147.....	Pursuit.....	Hispano, 220 horsepower....	2
Nieuport 28.....	do.....	Le Rhone, 120 horsepower...	9
Voisin VIII.....	Night bomber	Pregiot, 220 horsepower....	6
Italian manufacture:			
Caproni.....	Bomber.....	Isotta, 265 horsepower.....	1
S. I. A.....	Day bomber..	Fiat, 290 horsepower.....	4
Total.....			27

2. Regarding the second paragraph of your letter, a cable has been sent asking for the information regarding the number and performance of American-made machines at the front, which information will be forwarded to you as soon as received.

By direction of Maj. Gen. Kenly.

H. H. ARNOLD,
Colonel, Signal Corps,
Assistant Director of Military Aeronautics.

(Thereupon, at 4.30 o'clock p. m., the committee adjourned.)

REPORT OF SENATOR FRELINGHUYSEN ON THE AERO-MARINE PLANE AND MOTOR CO.
(INC.), KEYPORT, N. J.

I visited this plant on Saturday, July 6, 1918.

This is a small plant, manufacturing single pontoon hydroplanes of the advanced training type, equipped with the Curtiss OWX engines. They are building them under contract No. 3252 for the United States Navy; contract dated October 27, 1917. The order is for 200 machines and 50 sets of spares, to be completed in one year.

The capital of the company is \$50,000; the president is Englis M. Uppercu, the agent for the Cadillac Automobile Co. in New York City; J. S. German is vice president and E. D. Newman, secretary. They employ 975 hands, mostly all Americans, many of them being boat builders and carpenters from along the Jersey coast.

The plant is the outgrowth of eight years' experience in aircraft experiment and was formerly located at Nutley, N. J., under the same name. The morale of the workmen is excellent; the efficiency of high standard. The plant is protected by a company of police under an ex-New York detective, who is chief of watchmen. They produce a hydroplane for the United States Navy at an estimated cost of \$7,770.

Inasmuch as the contract is limited, as above, they stated to me a continuation of the production would probably reduce the cost, no machines having been rejected, and they state they are ahead of their orders. They have been having considerable trouble with the Dupont dope, stating that it would not hold.

They have had no difficulty in getting their spruce until recently, but are now splicing and using laminated spruce.

The plant is managed by Hinsdale Smith, a young man formerly president of the Springfield Metal Body Co., of Springfield, Mass.

The plant is an excellent one, shows good housekeeping, and the workmanship seems to be excellent.

Inasmuch as this plant is utilized at the present time by the United States Navy, it is expected that their full capacity will be needed. My inspection has no particular significance on this investigation except to show that in the event of enlargement of the plant they would have a capacity for building airplanes which might be utilized with the experience and organization they now have.

JOSEPH S. FRELINGHUYSEN.

BUREAU OF AIRCRAFT PRODUCTION—CAUSES OF DELAY.

[For Senator Thomas, May 31, 1918. Exhibit C.]

INDEX.

I. GENERAL CAUSE OF DELAY.

II. SPECIFIC CAUSE OF DELAY ON—

1. Liberty engine.
2. Bristol fighter.
3. D. H. 4 plane.
5. Oxygen apparatus.
5. Tel and Jaeger tachometer speed indicators.
6. Cameras—10-inch, 20-inch, 36-inch, 54-inch focal lengths.
7. Aldis unit sights for machine guns.
8. Airplane compasses.
9. Synchronizing device for firing through propeller.
10. Radiotelephone.
11. Airplane dope.
12. Airplane cotton.
13. Castor oil.
14. Spruce and fir.
15. Tool makers.
16. Transportation.
17. Other accessories and materials.

I. GENERAL CAUSE OF DELAY.

Senator Thomas's letter dated May 27 requests "Reasons and excuses, if any, assigned for failure to produce all or insufficient production."

1. The delays in aircraft production are, for the most part, those incident to the creation, under strenuous conditions, of a new, highly technical industry. In this the experience of the United States closely follows that of the allies.

Submitted herewith is a copy of the British War Board's report, which, after three years of war, very accurately describes our first year's experience and might well serve as an answer to your inquiry.

2. At the time the United States entered the war there did not exist in this country specialists trained in the design, manufacture, and use of airplanes, engines, and other accessories suitable for combat work in Europe.

Our experience and such facilities as we had were limited to the simpler forms of flying machines, and up to that time no airplane had been built in this country that carried a machine gun, or bombs, or other kindred war paraphernalia. The few planes used in the Mexican campaign were flying machines only, and not combat machines.

Two European engines, developed under war conditions for airplane use, had been put into production here, the 100-horsepower Gnome and the 175-horsepower Hispano, but by the time our American designers had translated the European drawings so as to meet American conditions of manufacture and the tools, bought raw materials, educated workmen, inspectors, etc., and organized production, so much time had elapsed that these motors had been superseded on the front by others.

Up to the beginning of 1917 not 118 airplanes of all types had been delivered to the Army, 64 of these being of the type used by the British in the first 14 years prior to 1916. Not one of these airplanes had been built in this country, nor had we any engines, but the Government was not at all slow to see to it that our production should begin. There was no lack of organization in the Signal Corps, no Aircraft Board, and no means to work for.

The Aircraft Production Committee was created in May, and a mission composed of Army and Navy engineers and experts under Major Boothby was sent to Europe in June to investigate the situation there, and bring back to the United States of engines, parts, and accessories to be used to facilitate the production of combat planes as were selected, and to secure information as to engines, instruments, accessories, and all necessary practices, data on material, specifications, and other data to facilitate production in this country.

Right here is where delay in the production of combat planes commenced. Samples of planes recommended for production were not received in this country until five months after we declared war, and these samples were without engines, except the Sopwith, and such drawings as accompanied them were totally inadequate for duplication according to American methods of quality production.

During the five months before samples were received, and while their redesign was being accomplished, all possible speed was put into the building of training planes and engines, so as not only to meet our training needs but to assist in the education of additional sources of supply available for the building of combat planes.

3. Detailed engineering information was not supplied promptly, stating what and how instruments, accessories, and ordnance should be placed on the combat planes.

4. Lack of sufficiently skilled instrument mechanics capable of interpreting and producing delicate instruments required for combat planes.

5. Lack of engineers skilled in the design and production difficulties of a combat airplane. This lack of proper engineering ability, which had not been developed in this country, was due to the fact that previous to the declaration of war there had not been a demand from the Government for the development and production of combat airplanes. This resulted in designs not being correctly made and the failures not being determined until tests could be made of the airplanes in the air.

6. Another most serious difficulty was the fact that after accessories, ordnance, and instrument equipment had been determined in December, 1917, and January, 1918, changes were directed by orders from the American Expeditionary Forces, dated January 10 and delivered in this country about February 16 to the Production Engineering Department. These changes involved serious

complications, as the placing of two instead of one machine gun firing through the propeller. This change involved a redesign of the fuselage, cowl, and the arrangement of connections between the engine and the various instruments, due to additional space required for the cartridge boxes and the chutes for taking away the empty shells and the disintegrating links from the machine guns in such a way as to avoid interfering with the connections to the other apparatus, and also involved changes in the support of machine guns and other parts.

7. These difficulties were largely due to the distance of the United States from the front, and to the lack of capable trained technical personnel in both Europe and the United States. Furthermore there has not been organized up to this time an effective, continual weekly liaison between the technical departments in Europe, England, Italy, and the United States.

8. It must be further recognized that this country was called upon not only to educate the engineers, but to develop the manufacturing facilities for quantity production of combat engines, airplanes, and the many accessories, instruments and ordnance with which an airplane must be equipped. The difficulties can not be conceived or described. Experience only can enable the most capable engineering mind to interpret the requirements and performance of a combat plane; and, furthermore, the United States did not have a proper comprehension of a combat plane completely equipped, so vitally needed to guide the engineer and manufacturer before his design and manufacturing methods could be fully developed.

II. SPECIFIC CAUSES OF DELAY.

1. *Liberty engines.*—The first Liberty engine was of eight cylinders. The order to build it experimentally was given June 4, 1917, and the first sample was delivered and running in Washington about July 25. During August it became apparent, through cable advices from our mission in Europe, that the airplane art was progressing so rapidly that this eight-cylinder motor would in all probabilities be obsolete for combat work on the front by the time it was possible to produce it in quantities. Our mission in Europe urgently wished us to concentrate our energies upon the 12-cylinder Liberty instead. As the result of this our effort was transferred to the 12-cylinder, and tentative arrangements for the manufacture of the 8 cancelled in favor of the 12.

It is impossible, in a report as brief as this must be, to cover thoroughly all of the reasons for delays in the production of Liberty engines, and only a few will be mentioned.

The 12-cylinder Liberty was designed on the basis of developing 330 horsepower. Continual experiment developed improvements from time to time in such matters as carburetor, intake headers, cam shapes, etc., which gradually increased the power obtainable to over 400 horsepower. Each improvement as it came up was considered on its merits and decision reached as to whether its introduction was worth the delay and scrapping of material that might result from its adoption. When the Liberty engine was originally designed and rated at 330 horsepower it was believed that it would be possible to obtain much higher horsepower out of it, but it was not expected that this would be accomplished so soon.

Increasing the horsepower of the engine made necessary changes in parts which showed weakness under this increased power. Several important elements had to be strengthened, requiring the making of new dies, tools, and fixtures, and entailing a delay in production.

When the manufacturers began to produce parts for Liberty engines and to assemble these parts they made application for many changes to facilitate their own manufacturing operations.

When the engine was finally through its experimental and early manufacturing stages and being more generally used in airplanes in cross-country work, altitude tests, etc., difficulties with radiation, carburetion, and lubrication were encountered and had to be overcome.

In addition to these points, having to do more particularly with the original design and its transition through the stages of early experimentation, increase of horsepower, flying tests, and standardization for manufacture, there were many unlooked for difficulties to be overcome in the securing of the raw materials, equipping factories with machinery, tools and fixtures, and the training of skilled workmen under the strenuous conditions that have existed during the past six months. The making of the Liberty steel cylinder by the Ford Co.

from tubing instead of from a solid forging, as was done with each of the experimental engines and with quite a number of the first deliveries, was in its way one of the real achievements in this part of our air program.

2. *Bristol fighter*.—This plane was received from England minus an engine, but designed to use either the Hispano-Suiza 200-horsepower or the Rolls-Royce 190-horsepower. This country was informed that engines of greater horsepower would be required, so as to get more speed and better performance. This Bristol fighter was therefore redesigned at the Smithsonian Institute so as to use a Liberty engine of increased length, weight, and power.

The design and sample plane were submitted to the Curtiss Co. in November, 1917, and when the first sample was assembled it was found that for manufacturing reasons changes had to be made. Almost coincident with these changes instructions were given by the American Expeditionary Forces to the production engineering department, under date of February 16, that two instead of one fixed machine gun, firing through the propeller, and other changes in instruments and accessories were to be made in equipping this plane. These changes and the lack of experience on the part of the manufacturer of this type of combat plane caused delays of at least six weeks.

When the first planes were built and tested it was found that the sample plane did not meet expectations as to the maneuverability. British fliers experienced in flying this Bristol fighter stated this to be their opinion, and changes necessary to obtain an improved performance are now being made. Official tests will be conducted as soon as these changes are completed in order to determine to what use this plane will be put by our forces in Europe.

The development of this American Bristol fighter is a particularly good illustration of the lack of airplane engineering talent and the necessity for the greatest caution in attempting to adapt an airplane to a particular engine.

(a) The principal difficulties causing delay in the production of this plane were due to a failure to determine what ordnance, accessories, and instruments would be used and where they would be placed.

(b) Lack of detailed engineering information concerning the radiator. Tests were made with this machine flying from the early part of November, during cold weather, during which tests the radiator was apparently satisfactory, but when tested under summer conditions the radiator was found unsatisfactory at low altitudes. The art of designing and manufacturing airplane radiators is still in the state of imperfect development in the United States, and much difficulty continues to be encountered in satisfactorily producing them in quantity.

(c) The changes in the number of machine guns and in the arrangement of the accessory apparatus were responsible for many weeks of delay in the production of the first planes, these changes being ordered by the American Expeditionary Forces' instructions to the production engineering department February 16. With better airplane engineering talent and with experience these delays would not have occurred.

4. *Oxygen apparatus*.—(a) A sample of dryer oxygen apparatus was brought to this country by an engineer, Monsieur Jacques de Lestang, and later the designer, Col. Dryer, came over himself to assist us in many difficulties which our manufacturers experienced in reproducing this delicate, complicated design.

(b) The French had undoubtedly been able to make a success of the comparatively small number which they had produced through the fact that they had a larger number of skilled workmen accustomed to this kind of delicate work. We did not have such skilled help, and consequently it took us 8 to 10 weeks to develop the necessary personnel and manufacturing facilities to produce this apparatus in quantity.

5. *Tel and Jaeger speed indicators*.—This apparatus consisted of a delicate watch mechanism, made by hand, in Europe, and of an extremely complicated nature. We have developed the necessary mechanics and engineering knowledge to produce this apparatus satisfactorily, but we were delayed 10 to 12 weeks on account of these conditions.

6. *Cameras*.—(a) We experienced the greatest difficulty in finding out from Europe what focal length and kind of cameras were suitable to use for the very complicated condition of taking photographs from an airplane at heights varying from 2,000 to 15,000 feet, the focal lengths of the cameras varying, according to reports which were received, from 10 inches to 54 inches, and there being two different schools of camera experts in France and England.

(b) We were also confronted by the impossibility of securing in this country dense barium crown glass necessary for the lenses to use in these cameras, and

the lack of ability and knowledge of our glass experts to produce a glass which would even approximate dense barium crown. This condition delayed our ability to design a camera properly, or even copy one from Europe and be able to give the necessary data to the plane designer as to the space to allow in the fuselage for the camera mounting, the kind of control, and the location of the controls for the operation of the camera on the plane. We advertised for lenses and secured quite a few. Our scientists actively pushed the experiments on the necessary glass, and we have at last secured what looks to be a promising substitute, although not in any way equal to the dense barium crown glass produced principally in France in a small way.

7. *Aldis unit sights for machine guns.*—(a) These sights, in order to be efficient, require dense barium crown glass for the lenses, on which the difficulty in securing the same was similar to that of cameras.

(b) We tried an American made glass with the result that the Aldis sights were about 60 per cent as effective as those abroad. There was a delay of at least 16 weeks in developing a sight of this kind.

8. *Airplane compass.*—Most serious difficulty was experienced in developing and producing a satisfactory compass, which is exceedingly complicated when used on an airplane. Samples were brought from Europe in September, and immediately the design and production were turned over to the Sperry Gyroscope Co., who had the most experienced skilled personnel on this kind of apparatus. They failed to produce a satisfactory instrument or to meet even a small percentage of their estimated production. It was therefore necessary to develop an entirely new source, which fortunately was accomplished through the patriotism and appreciation of the necessity on the part of the director of meter production of the General Electric Co., at West Lynn, Mass. This company developed and put into large production a compass which, while not yet completely tested, has every promise of meeting the requirements, but deliveries could not be obtained until the early part of April.

9. *Synchronizing device for fixed machine guns firing through propeller.*—Satisfactory output of production on this complicated device was delayed due to a lack of knowledge and experience. As a result of engineering study and ability of the men engaged in reproducing the same there should be no further difficulty in meeting the requirements.

10. *Radio equipment.*—No difficulty was experienced in reproducing the ordinary radiotelegraph equipment, but this country has developed and given a great contribution in the form of a satisfactory radiotelephone set which can be used from plane to plane or between plane and ground, at distances up to 5 miles or more. Manufacturing facilities were developed along with the design and sufficient production will be available.

11. *Dope for airplane wings.*—An enormous shortage existed of the special dope required to treat the wings of planes. This dope is derived from the acetate of lime, acetone, and their chemical by-products. The allies also required large tonnage for their planes and for explosives. New chemical methods of producing this dope have been developed and plants have been and are being constructed which will produce an output by 1919 about sufficient for needs expected. The output of present wood chemical plants was entirely commandeered and is now being distributed for war and industrial needs by the Government.

12. *Cotton for airplane wings and balloons.*—Shortage of Irish linen and the delay and cost of bringing it from England became very serious in the fall of 1917. The cotton experts designed a strong, light cotton cloth, then developed and obtained sufficient manufacturing facilities to supply not only the United States but also the allies to a large extent. As soon as the shortage of linen became evident more than 10,000 bales of long staple sea-island cotton was purchased without inflating the market, and is now available for use in this airplane cotton. A prominent executive of the British war mission has cabled his Government that in his opinion this airplane cotton is the "greatest contribution of the United States to the allies of a material necessary to airplane production."

13. *Castor oil—Lubrication of rotary and possibly fixed type engines.*—A serious shortage was foreseen and a large per cent of the available stock of castor oil in this and other countries was purchased and stored. It being recognized that the amount obtained would not be sufficient, an organization was developed and a campaign through the various States was launched through which farmers were persuaded to plant more than 100,000 acres in castor-oil plants. The beans from these crops will be purchased by the Government at a fixed

price and shipped to crushers to extract and refine the oil. If the yield is average the requirements now known to exist for castor oil should be met by this accomplishment.

14. *Spruce*.—Spruce is the strongest wood obtainable, for its weight. Next to spruce comes fir. In ordinary times there is no wide demand for spruce of the first class. Therefore, a shortage of this wood soon made itself felt. The largest supply of first-class spruce comes from Oregon and Washington. Large scale operations in these States met with serious organized opposition by the I. W. W. In addition to this further delay was increased by natural shortage of labor and lack of facilities to meet this emergency. It was necessary to organize regiments of experienced woodsmen selected from the cantonments of the National Army, and by voluntary enlistments from civilian life. The introduction of these men into the logging camps gradually overcame opposition to Government spruce production. However, in order to obtain the necessary amount of spruce it was, and still is, necessary to build railway extensions and logging roads, and in addition it became necessary to construct dry kilns and special cut-up plants to secure the quality of straight grain, clear material required. The demands of our allies still are greatly in excess of the present production, and large development of spruce timber and special sawmills will be necessary. The cut-up plants and dry kilns have made a large comparative reduction in the tonnage of spruce moved from the Pacific coast to the manufacturing plants and eastern seaports. This has been accomplished by eliminating shipment of green wood and confining shipments solely to selected and carefully inspected lumber of proper size and quality wherever used.

15. *Tool makers—Skilled mechanics*.—Other serious causes of delay were general shortage of tool makers and skilled mechanics due to the demands of other Government plants not engaged on airplane production.

16. *Transportation*.—The extreme severity of the winter caused serious trouble with transportation, delaying the delivery of raw materials and manufactured parts to airplane manufacturers. Certainly 30 days' delay on certain vital parts can be attributed to this cause.

17. On other ordnance, instruments, and materials minor delays, mistakes, and difficulties in manufacture were experienced, but not to an extent to delay seriously the output of combat planes.

L. S. HORNER,
Lieutenant Colonel, Signal Corps.

[Open letter.]

Mr. JOHN D. RYAN,
Chief Aeroplane Production, Washington, D. C.

DEAR SIR: The Senate bill 4686, authorizing the director of aircraft production to form a \$100,000,000 corporation for the purpose of expediting the production of aerial apparatus, brings up the question of the policies to be pursued, and if the plans contemplate any improvement in the present primeval and inefficient Government system for the scientific development and perfection of motors and aerial apparatus.

When you accepted the directorship of aircraft production you undertook the most difficult and important job in the whole United States war program. The building of ships is, by comparison, an office boy's job, for the reason that ships are a commercialized product and a developed art, and it is only necessary to increase output. Ships are essential to carrying on war, but superior aerial apparatus and supremacy of the air will win the war. Hence the importance of your job.

Washington is still asleep in conception and plans for a most efficient aerial program.

The failures and investigations of the aerial program have been brought on by fundamental errors in policies and patents, industrial and professional monopolies.

To what extent the situation has been complicated by monopoly systems is something the investigations should determine, so that the country may be relieved from such menace from now on.

One point I particularly wish to impress you with is that the success of the aerial program and the war against Germany is most seriously jeopardized by failure of authorities to realize that the present art of aerial warfare is not 10 per cent developed.

In the course of, say, a five-year war, ships, guns, etc., will undergo some improvements which may amount to 5 per cent or, in some things, 25 per cent. Aerial apparatus, however, can be improved several hundred per cent as an efficient and aggressive art of war.

The United States may build hundreds of millions of dollars' worth of aerial apparatus; but if we allow the enemy to excel us in the art, our men and aerial equipment will suffer needless sacrifices—even defeat could result.

If Germany's experts had foreseen the unlimited opportunities in aerial warfare and directed her efficiency and resources to this end instead of concentrating on submarines and dirigibles, and in addition had turned 30 per cent or 50 per cent of her sacrifices of shells, guns, and men toward the perfection and building of improved aerial equipment, Germany, with a small part of the losses already made, could have paralyzed the munition and transportation organizations of France and Italy and also carried such warfare into England.

Germany is doubtless awakening to the opportunities and advantages of aerial warfare, but our Government methods for the scientific development of inventions and aerial apparatus, I repeat, are not 10 per cent efficient. Our aerial program has been more or less of a patents, industrial, and professional monopoly, which has brought on failures and investigations, with lasting discredit to men who may be found responsible or incapable.

The indications are that a system of press propaganda has been carried on designed to deceive the people and administration. There apparently has been a program of secrecy, which could not deceive the enemy, but would operate to shut out valuable suggestions and cooperative work by the genius of invention and industry of the United States.

I would also call attention to the trend and danger of newspaper publicity and monopoly propaganda which inspires the people with the impression that the Liberty motors are the last word in motor perfection, and that, because some motors and planes are now being manufactured, the aerial program is on the high road to the peak of success.

I have never criticized the Liberty motor, because this would amount simply to an expression of opinion about things which can only be proven by actual performances and war service.

My criticisms have been constructive and refer to matters of principles and policies, which are supported by self-evident facts. My pamphlet, *The Men Who Can Win the War, or Things That Should be Known at the Capitol*, pointed out in advance wherein the aerial program could not escape serious failures. No adequate steps have yet been taken to meet these deficiencies.

The status of our aerial program to-day is: A captain of industry, heretofore charged with the management of extensive corporations, has undertaken the direction of aircraft production for the Government, assuming the duty of safeguarding public welfare in all respects. In other words, a man whose ambitions and associations lay with big business is now confronted with the task of deciding plans and carrying out policies which, in some instances, can not be agreeable to the schemes of powerful industrial organizations.

As a matter of self-protection and a guaranty to the administration and the people, and in order to secure cooperation and efficiency, definite policies should be announced.

The President of the United States is dependent on captains of industry, and men holding positions of responsibility and trust must reason that the public know that big business, under the direction of captains of industry, is more or less dominated by monopoly and "profiteering" systems; hence harmony and efficiency can only be obtained by open, clean-cut, patriotic policies.

Under the proposed bill the Government may be engaged extensively in the manufacture of aerial apparatus.

The first basic policy, which should apply to all war business, is that peacetime industries are national assets which establish the rank and power of nations among the civilized countries of the world.

The people and country as a whole are entitled to all the benefits to be derived from their billions of dollars spent for war equipment. If the billions so spent, first, purchase needed war equipment, and, second, build up the manufacturing industries, then the people and country have profited in two ways.

Now, if the Government takes over the manufacture of aerial apparatus, at the end of the war we shall have no manufacturing organizations ready to carry on a commercial business in aircraft or other industries, but, instead, the country will have a great Government organization which will suddenly go to pieces like a private corporation going into bankruptcy.

A second indefensible argument against the Government going into the manufacture of aerial apparatus is that it is the principle of private enterprise, operating on a legitimate competitive basis, which has made the United States, and only on this principle can we mobilize inventive and industrial genius and win wars and compete with the world. One reason for this is that Government ownership and centralized control direct all things into one narrow channel and shut out the inventive and creative engineering genius which has perfected the automobile and all of our industries. If motors and aerial apparatus were now perfect, and conditions did not change, then centralized Government ownership and control might be ideal.

The directors of the aerial program have fallen down because they ignored sound business policies. Instead of calling upon the industrial genius of the United States to produce the best motors and planes that could be turned out in competition, a few men have assumed the superhuman task of dictating all the intricacies of invention, design, and manufacture, when the industrial genius of the whole country can not do it too well.

The New York Times of June 27, quoting the British secretary to the air ministry, says: "The new policy of intrusting pure design to the industry itself has been very successful." If this means that the directors of the British aerial program have finally learned a principle which is so obvious from the analysis of commercial industries, then they have made one of the biggest steps toward supremacy of the air and are a long way in advance of the United States.

Referring again to the bill proposing \$100,000,000 for furthering the production of aerial apparatus, the people should know if the policy will be to favor a few large corporations monopolizing the business or if care will be given to the creation of a healthy, independent, and competitive industry. The difference between these two plans means success or failure, and the reasons are extremely simple.

If monopoly corporations are "handed" the business, there is no incentive on their part to improve aerial apparatus, because improvements cost money and changes curtail their output and profits. The grade of output will drop as low as Government inspectors can be induced to pass. On the other hand, if the Government policy encourages competitive manufacturers and awards products and also inventions of merit the Government will not only save money in the first cost, but get a superior manufactured product and at the same time be constantly improving the art, and at a minimum expense to the Government.

The monopoly plan means deterioration, graft, and defeat, and loading the industry with a gouty, corpulent monopoly system.

As a man who can point to some successes in business, manufacturing, and invention, my opinion of the cost-plus plan is that it leads to demoralization of both the manufacturer and his workmen. I also believe that investigation will show that in many cases this plan has resulted in the prodigal employment of men at a time when their services should be used more advantageously.

The manufacture of new products in war times at contract prices involves some risk on the part of the manufacturer, and it would be much better to let him make at the outset even what might be called a profiteering profit, because much of such profits will go back into the expansion of the industry or taxes on war profits. The point is to run the industry on a competitive basis, which operates to regulate profits and create the best conditions throughout.

The policies of the directors of the aerial program, including the National Advisory Committee for Aeronautics, show favoritism toward monopolies in patents and the industry, and the number of men and dollars which have been and will be needlessly sacrificed because of the blunders of the first year's aerial program can never be estimated for the reason that the direct and indirect losses affect the whole war program, and the end is not yet.

The enemy may succeed in taking Paris, whereas a few thousand airplanes might disorganize their transportation and save the situation and, if at the beginning, orders had been placed on a competitive basis, allowing manufacturers to copy foreign motors and planes or produce their own improved designs, the Government would have the choice of many manufacturers and the advantage of the cooperation of the best genius in the country.

All the Government engineers had to do was to limit purchases to a few simple specifications which covered a useful apparatus and, as the product began to exceed the demand, a system of competition and elimination would gradually bring about standardization as the art was perfected.

Instead of this a coterie of engineers and experts having a professional monopoly and on the theory that the aerial art in point of perfection had about arrived at the present stage of automobile production, they began at the wrong end of the program by a system of standardization and the stipulation of thousands of theoretical specifications which absolutely prohibit any improvements and even the economical production of useful apparatus.

It would be a pitiable example, indeed, if the Liberty motor did not prove a good motor, because never before in the history of the world did men have the unlimited backing of a national treasury and the Government stamp of priority which commandeered the facilities of the United States for experimental work. Withal, the Liberty motor is substantially an enlarged edition of a type of motors in use, and the problem is still unsettled if it is the best all-round type suitable for the various types of planes or even if it is the best type for any particular kind of plane. Competition only can prove this and develop the best motors, and the policies of the aerial program taboo competition.

If six post planes, equipped with Liberty motors, could each make three successful round trips between New York and Chicago, this would be more convincing to the public than press propaganda and afford some proof that a trans-Atlantic voyage is feasible.

The evil of it all is that the Liberty motor has been "starred" and paraded in the interest of individuals and monopolies. The scheme of fostering and press agenting it as a national progeny and calling it a Liberty baby instead of a Packard or something else was obviously to monopolize the field. Such press propaganda as heralded the designing of the Liberty motor in five days behind locked doors in Washington, etc., is too cheap and insidious for a serious country to tolerate and especially in war times. Such misrepresentation and nationalizing of one particular product is not fair to other manufacturers of motors and it also operates to prevent inventors and manufacturers producing improved types of motors. To use Senator Thomas's words in characterizing the cross-license agreement, "It is un-American; it is undemocratic; it is wrong. In my judgment it should be annulled without further delay."

Inventions and patents.—Senator Thomas's interpretation of the cross-license agreement, as described in the Senate Chamber and printed in the Congressional Record of May 9, goes to show that the policies pursued thus far have resulted in fattening the wallets of millionaire promoters and conferring rights of monopoly to an industry, on the one hand, and shutting the doors to the inventors and independent manufacturers of the United States, on the other hand.

The annual reports of the National Advisory Committee for Aeronautics are written evidence that this representative body of scientific men, charged by law with the supervision and direction of the scientific study of the problem of flight, with a view to their practical solution, are in part accountable for policies and transactions which have thus shackled the Government and the industry and mean the sacrifice of the people's resources in men and money through failure to encourage and even permit the mobilization and cooperation of our national genius which has perfected all of our industries.

When the history of the war and aerial art are reviewed years hence by the critical student, I surmise that the story of the National Advisory Committee will be pointed out as an example of the decades in which soaring professionalism so often failed because theoretical science lacked the balance of practical science.

I have no personal and individual criticism to make of men who have risen to the top of their respective professions. On the other hand, I hold in contempt the halo of professionalism which so often bars criticism, and especially when men's lives and the causes of our country are jeopardized by policies which are not thoroughly constructive and right.

According to the records of the National Advisory Committee for Aeronautics, a request from the War Department brought the response from the executives of said committee that in their opinion all parties and Government agencies connected with the development of the air service were cooperating in an efficient manner, and that nothing would be gained by the establishment of a department of aeronautics. A British expert says that our advance in research and experimental work during the first year of our aerial program has not closed the gap that existed at the time of our entering the war and that we are now further behind than ever. This may be taken as a testimonial showing the impracticability and extremely narrow field of usefulness of the present system of technical advisory committees.

The writer, in an interview with a chairman of the National Advisory Committee for Aeronautics, long ago sought to impress the fact that the plans and system of such committee could not, under the most favorable circumstances, prove anything like even 10 per cent efficient; whereupon said gentleman was shocked and explained in surprise that they had laboratories, etc., and were doing everything they could toward the development of motors and aerial apparatus.

When any dozen men think that they have more brains and genius than all the inventors, creative engineers, and manufacturers in the United States, and this eminent body controls the situation and is the technical and expert adviser of the War and Navy Departments in an embryonic art of war, on which our success depends, we are a long way from defeating our enemy.

Now, the Director of Aircraft Production is undertaking to provide the Government with aerial apparatus, and this equipment must be the last word in the art to be of service and win a war of invention and science. To express the present aerial program in plain words, the United States is furnishing the money and doing the manufacturing and we are going to depend on Germany and our allies to make inventions and discoveries, supply the intellect, and show us what to build, so that we shall be up to date. This is what our program amounts to.

Here we are, a Nation that has blazed the way and led the world in invention and the commercializing of many important industries, yet the men responsible for our aerial program, our best weapon in defeating Germany, have closed their eyes and ears to all the lessons and experiences of industries and science.

It beggars words to picture the situation, but the fact is that we have reveled so long in commercial debauchery, professional egotism, and deceitful propaganda that we need war to purify and regenerate our national systems.

The motor is the mainspring of the airplane and the key to supremacy and victory in aerial warfare. I have pointed out that the Liberty and all aeroplane motors have serious inherent faults which make them extremely short-lived, and that the short, uncertain hours of service necessarily result in the sacrifice of most valuable men and apparatus.

The life of aeroplane motors may be increased—doubled, trebled, and even multiplied by 10. Doubling the life of motors would substantially mean doubling the size of an aerial fleet, all things being considered. There is great opportunity for discovery and improvements in aeroplane motors which will reduce weight, decrease fuel consumption, and add to the mileage and carrying power. It is possible to make radical improvements which will cut complication of motor construction in half, and simplicity is the first essential to reliability.

I have sounded the forewarning that with German efficiency and American methods which do not mobilize anything like 10 per cent of our creative genius in invention and industry there is grave danger and probability of the enemy producing such superior aeroplane motors and other improvements as to cost us terrible losses.

As a practical example of this danger and the consequences, suppose Germany perfects combat planes which have, say, even 10 per cent more speed than our machines, and at the same time, through improvements in motors and apparatus, these machines are able to carry armor protecting the operator and vital parts of motors against machine-gun bullets or any guns carried by aircraft. Now, take the case of a score of our bombing planes, heavily loaded and slower in speed, on an expedition perhaps several hundred miles into the enemy's territory. Our combat planes guarding the fleet are outmatched in speed and armored protection, and at a further disadvantage in having to carry a greater fuel supply, whereas the enemy, being over home territory, could fly light and replenish their fuel tanks at convenience. The enemy would have great advantages in being able to take the higher altitude, follow, and attack at will, picking off our machines with certainty and little risk.

Admiral Fiske has been a strong advocate of aerial torpedoes. While I have no knowledge of his inventions, at the beginning of the European war I endeavored to inspire British experts with the importance of developing high-powered motors and types of airplanes which would carry and launch the standard torpedoes used by submarines and also be adaptable to aerial-torpedo and bomb work.

The field for aerial-torpedo and bomb apparatus is one of the most important in aerial warfare, and millions of dollars could be spent judiciously in its perfection. This science is capable of such development that troop ships and war

vessels of all kinds can be made to suffer a heavy percentage of losses. By the risk of one man's life a ship can be sunk with something like 50 per cent certainty, and a whole fleet might easily be caught with less than a minute's warning. It behooves us to make progress and forestall the enemy.

I have used the automobile industry so often for comparison, that readers may gain the impression that the work of developing aerial-warfare apparatus parallels the automobile art, whereas this would be underestimating the job before us many times over.

We should look at it in this way, viz, that the aerial art, as a science in invention, intricate engineering, and multiplicity of problems, is infinitely more difficult than the automobile which, by comparison, may be regarded as in the primer class.

It will be a grave error in policies if the United States aerial program is not planned to meet the emergencies of a long war; and, in this respect, we have already lost one year of precious time for which the Nation stands to be penalized heavily.

I fear we mistake by counting too quickly on victory in the air. Some say 10,000 machines, 50,000 machines, etc. The solution is to keep building machines, keep improving, and keep fighting, and the probabilities are that it will take us anyhow three to five years to gain supremacy in aerial apparatus and finish the job—except the enemy disintegrates.

Upon the question of fundamental policies, the directors of aircraft production and of aerial warfare are naturally dependent upon the opinions of experts and engineers. I would wager that if 12 of the country's distinguished professional engineers and experts were selected to determine the policies in respect to invention and the scientific development of aerial apparatus, that the majority of them would vote to assume the responsibility themselves, instead of for a system which would mobilize the genius of the whole country. Here we have an example of "professional egotism," which would willingly risk the lives of fellowmen so that they might be starred and honored by the glare of the spotlight, when 10,000 men ought to be on the job.

I make the suggestion to the gentlemen charged with the investigation of the aerial program and its policies, that this element of professional egotism, if it can be discovered, should be uprooted, as it is a blight which affects all Governments and most seriously retards inventions and industry in the present age.

On account of the business connected with the designing and manufacture of warships and of big guns being, by the nature of it, Government work, a very general and erroneous impression prevails that the engineering and designing problems in aerial apparatus should also be handled by Government experts and by Government departments. According to the recent words of the British secretary to the aerial departments, costly experience has finally taught the British the very thing I have been trying to impress upon the aeronautical clubs and upon the Government authorities at Washington for more than one year.

CONSTRUCTIVE POLICIES.

A résumé formulating the principles I have advocated into policies necessarily considers the aerial program as composed of two stages: First, development policies, which cover invention, design, experiment, competition, awards, and patents; second, production policies, including all processes in connection with the manufacture.

DEVELOPMENT POLICIES.

First. The Government must depend on and mobilize the genius of the inventors, the creative engineers, the designers, and the manufacturers of the whole United States if we are to excell our enemies in the perfection and supremacy of motors and aerial apparatus. This means the elimination of the present petty system of a theoretical sanctum sanctorum in which a few professional high priests presumptuously refine the genius of a whole Nation.

Second. Government engineers, departments, laboratories, etc., must be organized for the purpose of furthering most advantageously the scientific work of the Nation's practical inventors, creative engineers, designers, and manufacturers, such as furnishing data, technical information, making tests and trials of apparatus, and experting official trials and competitions.

Under the present régime our Government laboratory organizations are a part of the sanctum-sanctorum system and more or less a professional monopoly.

Instead of our laboratories being used to further the work of the country's industries genius and the most advantageous advancement of the arts and sciences the ideas and work of men of genius are appropriated and the laboratories grind chiefly to the honor of the professional high priests. (I have knowledge of cases.)

Third. It is essential that the Government establish a department of inventions, which may be known by this or any suitable name, the purpose of such department being to handle the business of the Government in all matters pertaining to the scientific development of aerial apparatus as generally indicated by policies 1 and 2.

As a matter of efficiency the personnel of said department should be permanent and competent salaried officials and employees, and such personnel should be prohibited from taking out patents for inventions or taking credit for ideas, designs, and suggestions, thereby removing as far as possible every incentive and opportunity for conflict with their natural duties.

Fourth. The department of inventions should comprise an award and competition system whereby trials and competitions would be held as often as practical and for the purpose of developing improved types and construction in aeroplane motors, combat planes, torpedo planes, post planes, torpedo and bomb apparatus, and every kind of essential equipment.

Awards of suitable amounts of money sufficient to cover cost of exhibition apparatus and reasonable preliminary experimental work plus a profit on such work should be paid to winners of contests showing advance in the art.

The awards in this class would not be intended to cover valuable features of invention, but primarily as competition and performance awards, thereby stimulating refinements in design and construction which contribute to perfection. In other words, the awards in this class would correspond to the "premium money" paid on the showing of a fast horse, a draft horse, or for a new grade of wheat, with the advantages in this case that the Government could adopt valuable features in design and construction not covered by United States patent rights, which would be provided for under policy 6. Naturally a manufacturer or builder exhibiting prize-winning apparatus should receive some extra consideration in the placing of Government contracts, governed, of course, by usual commercial qualifications.

This award system also has a great advantage in discovering and bringing out new men of genius as inventors, designers, engineers, and manufacturers.

The principle of this award system is highly progressive and advantageous to the Government, the people, and the industry. It benefits everyone except the monopolist, and because of this the plan may meet with strong opposition.

Fifth. The department of inventions would require a patents and inventions board, the personnel of which should be made up of men capable as judges and experts and competent to arbitrate all questions pertaining to inventions and patents, so that the development of the art would not be retarded and stifled, as at present, through the loss of years and the waste of money in a system of litigation which is favorable to monopoly and death to the expansion of industrial genius.

Sixth. A system of specific awards should be provided for the purpose of encouraging the discovery and perfection of valuable inventions, and particularly radical improvements in motors and all types of planes and apparatus and any inventions which add to our supremacy in the air.

Recognizing the fact that our present system of depending on advisory committees and experts to judge the merits of inventions in the "paper stage" is nine-tenths impractical and a prodigal waste of opportunity and time, the proposed award system would ordinarily apply only to inventions which had been reduced to practice or such state as to demonstrate certain and valuable results.

The announcement of specific awards of adequate amounts for the Government rights to valuable inventions in motors, combat planes, torpedo planes, etc., would lead manufacturers to concentrate on and develop such inventions. It would not only cause inventors to specialize on these things, but the announcement of such awards would materially assist inventors and manufacturers in financing the experimental and introduction work.

Seventh. Since our success in this war and our security and national preparedness hereafter will depend on our supremacy in the air, and inasmuch as aerial navigation and the industries in connection therewith will have much to do with establishing our standing as a leading nation of the world, the policy of the United States Government should be to purchase and throw open to public use all patents covering basic and fundamental inventions essential to the perfection of aerial apparatus and navigation of the air.

Respecting any useful inventions pertaining solely to aerial warfare, whether such inventions be fundamental or not, the Government should acquire the rights to Government use for war purpose by purchase or a part payment in cash and royalties, so that practical inventors and builders may be promptly assisted in carrying on such work.

PRODUCTION POLICIES.

First. The aircraft manufacturing business must be carried on by industrial organizations instead of Government owned and operated factories.

Fundamental principles which I have explained show that this is the only plan whereby we can excel in the art and also build up American industries.

As an exception to this principle there may for a time be some advantages in operating a Government factory where men and manufacturers can go to be trained in the work, it being understood that such factory would be highly specialized and combine the best practice and experience to be gained from the whole industry and scientific study of the business.

Second. The Government should encourage progressive independent builders and manufacturers and discourage monopolies and local concentration and congestion of the industry.

The policy of the Government in placing contracts should be to rid the industry of the vampire breed of business men, which schemes control by means of secret agreements and organizations, vicious patent monopoly systems, intriguing lobbies, and insidious press and trade propaganda, all of which operates to throttle and retard a national progressive development of the art and industry and thereby causes the sacrifice of the country's resources in men and money. These "systems" are conspiracy and treason, fully as dangerous as German propaganda, and the United States aerial program, to be efficient, must recognize and adopt policies which will eliminate such "systems."

Third. Government war-contract qualifications.

Definition of building and manufacturing. In the recasting of the aerial program it is very important to fully comprehend the term "building" and what it means to the industry in the present stage.

The term "manufacturing" applies to a plant, tooled and jigged for a rapid duplication of parts or all of a complete machine, whereas the term "building" means a plant equipped with standard woodworking or metal-working machinery but not tooled and jigged for most profitable quantity production.

Government authorities, automobile men, and many engineers now consider aerial apparatus as wholly a manufacturing proposition, and policies dealing with it as such are not progressive and will not make us leaders in the art. The reasons are simple, and because aerial apparatus is not 10 per cent perfected.

It was the builders of bicycles and the builders of automobiles who, more than the manufacturers, first combined and forced the commercialization of new and valuable features of invention, design, and construction. These new and valuable features constituted the successful builder's selling advantages and offset his increased cost of production until the builder became a manufacturer.

The moral of this is that if the United States Government is to produce superior aerial apparatus the Government must supply the incentives which the commercial industry normally provides, therefore the policies of our aerial program must foster invention and the builder of aerial apparatus.

The competition prize and award system and the inventions award system are the first steps in this direction, but it is equally necessary that producers of improved apparatus be encouraged as builders by awarding them such contracts as they can successfully turn out.

The present aerial program is marked for a heavy score of failures and partly because the idea of standardization is being too broadly applied, and years in advance of the perfection of the art.

To-day our great munition factories, cities, and railways are virtually unprotected because we have not superior types and equipment of the fastest machines or men skilled in fighting with them.

My proposition would be to consider the production of aerial apparatus as divided into two classes, viz. Foreign apparatus and domestic apparatus. Under this plan, generally speaking, standardized and manufactured apparatus would be sent to the European war field.

With the inauguration of the competition and award system the builders of aerial apparatus would find great incentive for the production of improved types of combat planes and aerial fighting and defense apparatus of all kinds, and the competitions of such apparatus would serve not only to perfect the best apparatus but, at the same time, would be highly advantageous in training men and making them skillful in the science of defense and warfare.

It is obvious that this plan would result in many makers of combat planes, each with its particular advantages, but that, as domestic fleets were built up, the progress of competition and elimination would constantly lead toward a perfected and standardized product.

It is my judgment, based on various sound reasons, that, if the enormous sum of \$1,000,000,000 could be spent, even semi-judiciously, on the domestic aerial program alone, commencing the first year now, the developments and results would be such as to save the country many men and a large war debt.

Successful invention and scientific work always means an immediate waste of anywhere up to 90 or even 99 per cent, but a 10 per cent, or 1 per cent gain, in the aerial art would be of inestimable value.

The system proposed, however, is extremely simple and the Government takes little risk because the inventor and the builder substantially make good before they receive Government recognition or the people's money. Under this plan it is only the men who finance a failure and bad judgment who lose.

Under the present "systems" everyone loses except the monopoly wolves.

As a further example of the fallacy of the present "systems," Government experts now dictate the technical limitations of postplanes when, in truth, it is only a simple business proposition governed by cost and performance.

Under the award and competition plan, the builder of a postplane which demonstrated superiority would not only gain the competition award but would be entitled to an order for machines which could be used on such route or some other route. In fact, the plane-post service might be operated and perfected most advantageously on the competition basis.

The Government, in placing contracts with a builder or manufacturer, should consider as qualifications: First, the standard of applicant's product in points of advanced art and grade of construction; and second, ordinary business qualifications, such as manufacturing facilities, promptness of deliveries, etc.

Fourth: Policy of prices on Government work.

The matter of fixing prices should be determined by Government authority based on good business principles. Under the present war conditions, it is absolutely essential that builders and manufacturers make a fair margin of profit because no industry can thrive and be progressive on starvation rations.

Capital can not finance manufacturing without profit, and schemes ignoring this fundamental business principle means that the Government and people are either going to suffer through want of such product or of being grafted indirectly.

A system of competition bids based on a minimum profit and record factory costs might be worked out to give the bidder certain points of advantage in the size of the contract to be allotted or in respect to a whole contract, but, since the qualifications named in policy 3 are essential features of any such contract, the various features should govern in relation to their respective merits.

Fifth: Government financing of the industry.

Our Government policies in any financing of the industry must be carefully planned and guarded against the creation of monopolies.

If "systems" and men, through influence, are allowed special privileges in the financing of their business or in obtaining contracts, it means that other manufacturers and builders are deprived and that the industry and country will suffer through degrading the standards of qualifications and the superiority of output.

Referring to the announcement just published that the plan of a Federal corporation to build aircraft has been adopted, I am not prepared to say that this plan is another misstep at the present moment, but facts and logical arguments show that it is, at best, a side step which, if temporarily necessary, is due to the missteps made at the outset in pursuing dangerous policies.

If the new Director of Aircraft Production has found that the commercial industries of the United States to-day are not sufficiently organized and equipped

to produce the required amount of aerial apparatus, it is prudent to analyze the reasons and also weigh the advantages and disadvantages of a Government-operated industry. No doubt this has been attempted, but the history of the war shows that the administration is confronted and surrounded with such complications that it is extremely difficult to know the truth.

One of the first steps taken, supposedly in the interests of the aerial warfare, was the act of authorizing a patents and industrial "monopoly system," and the adoption of policies which prohibited the investment of free capital, either in the development of inventions and the manufacture of improved apparatus, or the organization of manufacturing plants for turning out standardized apparatus. Every shrewd investor of money knows that when a state of affairs exists in which the business is controlled by a "monopoly system," that the investment of independent capital in such business is hazardous, and he further knows that, while he might become a licensee and a part of the "system," that his venture would be handicapped by royalty and other one-sided taxes, and that the men dominating the system would always have power to manipulate desirable contracts in their own favor.

It would be difficult to conceive a more successful scheme of indirectly curtailing the scientific development of the aerial art and the free expansion of the industry than the so-called cross-license monopoly cooperated with by Government policies.

If the principles and purposes of the United States patent laws are right, then the cross-license "monopoly system" is wrong and a crime in this war, because it defeats the objects of our patent laws and sacrifices the lives of men to greed.

Supporting the plan of a Federal corporation for the manufacture of aerial apparatus, an editorial in the New York Times of July 12 says: "The Shipping Board began to make headway with its elaborate program when the Emergency Fleet Corporation was established." I have given logical and indisputable arguments showing why the aircraft industry can not be most successfully managed along the lines pursued in the ship-building program.

Now, calling attention to the fact that the writer began in April, 1917, the writing and publishing of papers directed to impress men responsible for the aerial program that efficiency and marked success could only be attained along certain practical lines, it would seem that the time had come when such suggestions warranted fair consideration. If these suggestions were mere theories and opinions and without the backing of logical arguments, parallel examples and practical experience, then they might, with some excuse, be ignored, but when the author has been more or less instrumental in the exposure of dangerous policies and the workings of a "monopoly system," which can do as much harm as the most vicious German propaganda, these things are, in a measure, further claims to recognition.

If Government operation, by some miracle, could make skillful workmen out of pebbles by the roadside, this would be a strong argument, but on the contrary, Government employment has the reputation of decreasing the output of industrial labor; this, however, is a very insignificant reason compared with the arguments heretofore given.

Whether the proposed program means that the Government is going directly into the manufacture of aerial apparatus or plans to finance corporations already having a monopoly of the business, it amounts to an attempt to win the war by a spurt and a bet that with sheer weight of numbers we will outmatch any advance Germany may make in the art plus her peculiar natural advantages which amount to quite a handicap to us. We are pushing an unbalanced program in which the scientific side is sadly neglected.

I would further call attention of Government authorities to the fact that any plans for the extensive invasion of the enemy's territory means that we must have not only superior types and equipment in combat planes sufficient to match the enemy, but at the same time a large equipment in bombing planes and apparatus, whereas Germany, on a defensive plan, can get along without the big, expensive bombing planes and their equipment and concentrate her skill and production on combat planes, and by excelling us in this one direction, defeat our aerial program.

I am told that Schwab says that the trouble with Americans is that they so often figure as though the Germans were standing still; that they forget that this war is at present a more serious thing to them than it is to most Americans. This logic will apply to the aerial program; it might be all right if the Germans will stand still.

The United States war program to-day, so far as the Army and Navy are concerned, is on progressive lines, but the examples of the German offensive operations must be taken as an indication that the allied armies will find the road to Berlin just as difficult as the enemy has found it to Paris and London. The Germans have fallen down thus far for want of cooperation of an aggressive aerial program. German experts and officials from the start have underestimated the importance and opportunities of aerial warfare.

Therefore, the logical conclusions are that if the United States is compelled to defeat Germany it can only be accomplished by the gradual and scientific building up of an aerial fleet which in every respect is superior to the enemy. Our policies are plunging and gambling and not progressive.

What about after the war? Some men work hard, abuse their health, get their fortune and then die. If, at the end of the war, bad policies have demoralized and killed our industries, whereas our allies, enemy, and the rest of the world are organized for going on with business, the administration will be held responsible even by men who have profited by giving bad counsel that they might fleece the people with their "systems."

I believe that the country is so saddled with "systems" and the press so twisted with various kinds of "systems" propaganda that the war will be prolonged with great sacrifices and dangers of domestic disorganization unless big business and our national industries are carried on with more respect to the golden rule principles than prewar business is credited with.

At this moment the welfare of the Nation is largely in the hands of the captains of industry; the President can not do it alone.

Respectfully,

W. H. FAUBER.
55 Hicks Street, Brooklyn, N. Y.

JULY 14, 1918.

AIRCRAFT PRODUCTION.

TUESDAY, JULY 23, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2.30 o'clock p. m. in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.
Present, Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN A. JORDAN.

The CHAIRMAN. Mr. Jordan, at the time of the last adjournment your statement was postponed pending the receipt of certain correspondence from the Liberty Iron Works of Sacramento, Cal.

Mr. JORDAN. Yes.

The CHAIRMAN. The committee is in receipt of a telegram from Mr. J. M. Henderson, of the Liberty Iron Works, which I will read into the record:

There is no correspondence or telegrams in my possession or in the hands of Liberty Iron Works or its officers between any of parties mentioned in your letter of July 17 or any other parties connected with us regarding contract for 300 aeroplanes awarded to our company.

Mr. Henderson had previously written or wired me that he would, at his earliest convenience, send the correspondence which we requested in a telegram of July 15.

I wish you would tell the committee whether you know of any correspondence or telegram passing between the Liberty Iron Works and the Aircraft Production Board or any of its members in Washington regarding that contract?

Mr. JORDAN. Yes, sir. There is voluminous correspondence. There must be hundreds of letters that relate to the contract and its fulfillment.

The CHAIRMAN. Do you know why Mr. Henderson should have sent the committee such a telegram?

Mr. JORDAN. No, sir; I do not.

The CHAIRMAN. Inasmuch as we will have to proceed without that correspondence, at least for the present, I wish you would take up your statement to the committee where you left off and give such other information as you have in your possession regarding that contract.

Mr. JORDAN. Now, if the committee will bear with me, I think the best way to get at the matter will be to read this written statement.

The CHAIRMAN. As supplementary to what you have already said?

Mr. JORDAN. Yes, sir. While it repeats what I have already said in some places, I have enlarged on my original statement and made it much clearer, perhaps.

I arrived in Washington about July 27, 1917, and called upon the Aircraft Board, which was then in session at the War and Navy Building. I saw Messrs. Deeds and Waldon, who told me that they could speak authoritatively for the Aircraft Board. Mr. Deeds said very emphatically that my offer to construct aeroplanes for the Government could not be considered, for the reason that all the manufacturers had been selected who would do the work, and that this list would not be enlarged under any circumstances. I persevered, however, and insisted that here was an urgent necessity of a factory for the production of aircraft for the Government on the Pacific coast, and I finally secured the attention of Gen. Squier, who promised me consideration. Shortly afterwards I met a Mr. Farwell, who told me he was the confidential representative of Mr. Deeds. Mr. Farwell suggested that I visit the Curtiss plant at Buffalo, and he gave me a letter of introduction to his cousin, who was employed at the Curtiss plant, in charge of one of the departments.

I went to Buffalo and met Mr. Farwell's cousin. He took me through his department. I had several talks with him as to sources of supply for metal parts. He made no reference to the cross-license association.

I saw Glen Curtiss. I asked Curtiss if, in the event of our receiving a contract, he could furnish us enough of metal parts, stampings, and forgings to get a start and enable us to make connections with other manufacturers of parts. He said, "We will help you out in any way we can. Some parts we may be short on, but we will do all we can for you." He then sent me through the shops under the guidance of an engineer who was very courteous and who showed me all the machinery and the parts their machines were producing. This guide told me that some of the parts could be turned out in excess of their own requirements, while in order to keep up the supply other parts were made outside of their own shops. He took me through all departments and showed me everything that was of interest to me.

I returned to Washington. I made frequent calls upon Mr. Coffin and Gen. Squier, appeared several times before the Aircraft Board while the board was in session. I had another interview with Mr. Waldon, who said again very emphatically that I could not get a contract.

Finally, about September 25, 1917, the Aircraft Board awarded me a contract for 300 machines. I went at once to Shepler, production engineer of the board, and asked him for a set of blue prints and specifications. He said that the department did not own a set. I asked him if he was familiar with the plans and specifications of the JN4D, and he said he was not; that the blue prints and specifications had never been given to him. I asked him who checked the blue prints and specifications for the Government, and he said he did not know. I asked him if anyone in authority had approved of the blue prints and specifications for the Government and he again said he did not know. I remarked that it was an extraordinary proceeding to undertake to construct something for the Government on blue prints and specifications which had never been checked or approved of by any official, and he said I would have to work out my own salvation.

I had been engaged in construction work for the War and Navy Department before for many years, but I had never before seen or

heard of a contractor accepting a straight priced contract without the privilege of examining and checking the blue prints and specifications, which had previously been approved of by some Government authority. I had never before heard of the Government obligating itself for a million and a half dollars without first knowing what they were going to get for it, and I never heard of a contractor obligating himself to do something while he had no conception of the details of the work.

Shepler finally said, "Well, I can't help you any. See Col. Montgomery, and he will get you the blue prints and specifications." I saw Col. Montgomery, and he said that the price fixed for the machines was the same in every contract, and that there was a good margin of profit in the work; that Col. Deeds had told him that the machines would not cost the manufacturers to exceed \$3,000 each, and that I need not be afraid to go ahead. He told me then that I would have to go to Buffalo to the Curtiss plant to get the blue prints and specifications. I asked him if he would not get them so I could go over them with Shepler, and if there was anything that was not clear to clear it up while I was in Washington. He said, "No, you will have to go to Curtiss in Buffalo to get them." He then handed me an order signed by Col. Waldon, addressed to the Curtiss Co., requesting them to give me the blue prints and specifications. I went to Buffalo and the blue prints and specifications were delivered to me at a desk in the engineer's office of the Curtiss plant. I spent two days checking the blue prints. There were approximately 600 of them. These were sadly mixed up. There was no continuity of the planes.

For instance, No. 160 showed a clip in the fuselage, and No. 161 showed a mast on the aerolon, the extremes of the machine. I was handicapped in the checking, because I had no general assembly plan; that is, the master or key plan. However, I satisfied myself that I had all, or nearly all (it was not possible to determine exactly), except the nose plate and general assembly prints. These I was assured by Mr. Mueller, Curtiss's chief engineer, had not been released. I asked him when I could have these two most important prints. I could not build a machine without them. He said he would forward them to me within a week. As a matter of fact, I did not get them until late in December and early in January, respectively.

After checking the prints, I had them tied into a bundle, and then a clerk from Mr. Morgan's office came to me and said Mr. Morgan wished to see me. I went to Mr. Morgan's office and there found Mr. Morgan. I asked Mr. Morgan if he could furnish me some of the metal stampings and drop forgings to give me a start, and he said he thought they could. I then said, "Can you give me at least one of each of the parts as a sample, from which I can get the angles and bends," and he said, "Yes; I can promise you that anyway."

Then came in Mr. Guy with the chief engineer and another of the company's officials. I was introduced all around, and they were all very cordial. Then Guy asked if I had found all the blue prints and specifications, and I said they were not complete and not very well drawn, and in many places were badly printed. I told him I was short the two very important prints—nose plate and general assembly. He said, "Yes; we will release those to you in a week or so." He then told me that I would have to enter into the cross licensing agree-

ment and agree to pay 1 per cent of the contract price for the use of the blue prints and specifications, 10 per cent of this sum to be paid in advance of the delivery of the blue prints and the balance when I returned home; also that I would have to pay \$200 on each machine I built. This \$200 was to be paid to the Curtiss Co. for and on account of cross licensing the Aircraft Association, and by them distributed to the Wright and Curtiss Cos. This was the so-called cross-license agreement. I declined to pay either of these amounts, or any other amount, and Guy refused to give me the prints which I had checked and bundled up.

I returned to Washington and took the matter up with Mr. Coffin, who assured me that I would not be required to pay anything to anybody. He referred me to Col. Montgomery. I saw Col. Montgomery, who told me that he would send his brother, W. W. Montgomery, to Buffalo to straighten the matter out. I returned to Buffalo, and there met W. W. Montgomery. He had seemingly seen Guy, of the Curtiss Co., and had arranged matters. He told me that I could get the prints from the Curtiss Co. without further question. I did get the prints and went to Sacramento and started the work of securing materials.

A few weeks later a young man named Cook came to the Sacramento plant and introduced himself as representing the Aircraft Production Board, as the Pacific Coast production engineer. He gave me a list of manufacturers who, he said, had all the facilities to produce the metal parts. I at once got in touch with these manufacturers (see correspondence which the Senatorial Committee has requisitioned from the Liberty Iron Works).

About this time the department inspectors arrived at the plant, headed by a Mr. Wetzel. We were then manufacturing wire parts, aluminum parts and wood parts. The inspectors, with the exception of Wetzel, had no knowledge or experience in aeroplane construction or in the materials, either metal or wood, which entered into the construction. They rejected a large quantity of materials which were perfectly good and passed some materials which I would not allow to be used. We started the manufacture of the nose plates, and the first several of these cracked in the bending. I would not allow these to be used and they were put in a scrap pile. We made many small parts which I rejected because I did not consider them up to the standard. The inspectors rejected many parts and they were scrapped. Shipments of parts ordered from Cook's list of manufacturers began to arrive, from Barcalo & Co., of Buffalo, and some others. In the first lot there was a quantity of clevises, which had already been rejected by the inspectors at the Curtiss plant but notwithstanding such rejection were shipped to us. I sent them back.

Then came bolts from the Erie Specialty Co., of Erie, Pa. These did not conform to the specifications, and I sent them back. I had great difficulty in securing the metal clips. I had offers from several eastern manufacturers, and placed orders which were accepted, but not filled. (See correspondence in Liberty Iron Works files.) I ordered a large quantity of bolts and rods from the Harvey Machine Works, Los Angeles, who accepted the order and promised delivery. They had the steel on hand and were then engaged in making the bolts and rods.

When the deliveries failed I went to Los Angeles and took the matter up with Harvey. He told me that Remington, who at that time had a contract from the Aircraft Board for landing gear parts, had a prior call upon his product, although Remington could not use these parts as fast as Harvey could make them. Harvey assured me of this, but said he was powerless to give me even the excess parts without Remington's consent. I saw Remington, who said he expected to open up his production to a point where he would use all the Harvey output. As a matter of fact, he never did so, and Harvey afterwards furnished bolts and rods and filled the order, but this delayed us a full month.

Howell, who was in charge of the inspection bureau of the Pacific Coast, advised me that the American Coin Register Co., of Oakland, Cal., could turn out certain parts; it afterwards transpired that Howell was a stockholder in this concern.

I placed a large order with the American Cash Register Co., but they failed in delivery. I canceled the order and had a hot controversy with Pattison, who succeeded Howell in the office of the Chief Inspection Bureau. Pattison insisted that I must not cancel the A. C. R. order.

He was very closely associated with Howell at that time. Shortly afterwards Pattison was relieved from his duties on the coast and was sent to Detroit.

Howell was formerly in the Navy and had no experience in airplane construction when appointed chief inspector. He selected his subordinates, and with a few exceptions, out of the 20 or 30 men whom he selected as inspectors at the plant, none had any experience in construction and in handling either wood or metals. Pattison was formerly a maker of automobile trailers in New York, and was without experience in airplane construction. He made a few changes in subordinates and those he selected were of the same quality as the rest. They were all young men, some of whom frankly admitted that they joined this inspection bureau to avoid the draft.

About February 1 we were at a point of production. We were lacking only some of the clips and forgings. My directors began to complain of the large expenditures, and that we were not producing machines. They admitted that it was impossible to secure the small stamped parts and attributed this to me. The president expressed the idea that I was *persona non grata* to the eastern crowd, because of my opposition to the attempted hold-up by the Curtiss crowd and that they had influence enough to have our orders sidetracked. So it was decided that I should resign the active management of the plant, which I did.

The new manager was wholly inexperienced in shop management and in aeroplane construction, and two days after the change was made our contract was canceled. I learned afterwards that the department at Washington had been advised by their Pacific coast representative of the change of management just on the event of production, and seemingly did not approve of the plan. A week later the new management had employed Wetzel, the Government's chief inspector at the plant as superintendent at a salary of \$500 a month. He had been paid \$150 a month as an inspector. There was at once a radical change in the methods of inspection at the plant, and materials which had been rejected by the inspectors were brought

from the scrap heap and from the salvage rooms and incorporated into the machines. Among other things were several nose plates that were cracked in the making, which were scrapped by myself. These were welded up and used.

The department at Washington had sent us a sample machine from which to check our work. This machine was of little value, it being of a different type from the machine we were building. Some of the parts, however, were similar, and these parts were taken from the Government-owned machine with the full knowledge of the Government inspectors and incorporated in the first machine sold to the Government. In other words, the Government bought over again its own property, with the full knowledge of its representatives.

I objected to this proceeding because I did not know whether the parts were standard or strong enough, and they might be a serious menace to the safety of the machine, and also that we had no right, morally or legally, to sell the Government's property, that the Government had already paid Curtiss & Co. for and still owned. I also learned from the mechanics that the parts I had rejected myself were being used, and I was seriously alarmed. I went to Mather Field and called the attention of Maj. Emmons, commandant at the field, to the inadequate inspection by the Government inspectors, and Maj. Emmons said he knew the inspection was "rotten" and could not be depended upon, and for that reason he was having the machines carefully gone over by his own men, who were removing the bad parts and reenforcing and strengthening other parts in order to make the machines safe.

The CHAIRMAN. You have said nothing there about Fowler or United States aircraft machines.

Mr. JORDAN. No; but the same statement applies to all three.

The CHAIRMAN. You have stated that he sent back four or five of those machines.

Mr. JORDAN. Yes; I was so informed. That order came from Washington, I believe. I did not go into the details of it.

Another thing that I took up with Emmons was the steel in the small metal parts, on which great strain comes.

The specifications require a tensile strength of from 60,000 to 80,000 pounds. They never once tested it out to see what kind of steel was in them; that is, no chemical analysis has ever been made by the Aircraft Board to the steel to my knowledge.

In conclusion I beg to say, and I say this advisedly, that if we had had the full support of the Aircraft Board in the matter of securing blue prints and materials that we would have delivered the airship without any delay as the undertaking was entirely practical.

Preferred stock—list of stockholders of the Engel Aircraft Co.

	Number of shares.		Number of shares.
Arter, Frank.....	100	Beeman, B. O.....	5
Andrews, W. H.....	5	Barricelli, G. A.....	5
Atwater, A. L.....	3	Byron, F. E.....	5
Allen, S. W.....	2	Brown, Samuel.....	20
Bill, Dr. A. H.....	100	Baird, H. M.....	1
Bender, C. W.....	10	Brown, Harry C.....	2
Baker, E. H.....	50	Bause, George J.....	6
Barnes, H.....	50	Butler, J. G.....	100
Bentley, A. J.....	50	Case, F. C.....	25

Preferred stock—list of stockholders of the Engel Aircraft Co.—Continued.

	Number of shares.		Number of shares.
Coffinberry, J. B.....	35	Johnson, W. T.....	25
Chamberlain, W. W.....	56	Jones, Clinton.....	5
Chapin, George W.....	5	Keim, C. R.....	2
Culbertson, H. E.....	15	Klanowski, Stanley.....	5
Clayton, H. W.....	10	Lang, E. J.....	1
Clayton, W. B.....	10	Lyon, W. F.....	50
Campbell, Thomas B.....	6	LeFevre, W. N.....	5
Crabbs, H. W.....	5	Lininger, J. M.....	15
Capper, C. C.....	10	Luckish, M.....	2
Coburn, Mrs. J. M.....	2	Lininger, J. A.....	5
Cottrell, Gertrude.....	1	Ingersoll, A. F.....	10
Dewey, F. L.....	1	Lally, R. B.....	10
Doubler, Edw.....	5	Leitch, Rebecca J.....	5
Doyle, J. E.....	10	Lininger, L. D.....	2
Davis, J. R.....	5	Lezius, Carl F.....	10
Drake, George W.....	2	McConnell, F. C.....	5
Deming, T. H.....	5	McCorkle, R. L.....	25
Donaldson, A. G.....	1	McKinstry, J. S.....	3
Durkin, James F.....	1	McLaughlin, J. R.....	10
Dolon, Charles A.....	50	Morris, Isaac.....	2
Ewald, J. S.....	2	Munson, Julia LaV.....	5
Engel, William.....	10	Merrill, George B.....	5
Eagan, M. L.....	3	Madden, Thomas.....	15
Fairchild, E. M.....	50	Moffett, H. E.....	1
Firestone, H. S.....	100	Manley, Dr. O. T.....	2
Fuller, Joel H.....	50	Miller, T. U.....	2
Fairchild, —.....	50	Moore, Gertrude K.....	1
Finney, D. J.....	35	Miller, Cloyd W.....	10
Fisher, M. F.....	50	Mueller, Carl H.....	8
Frostbauer, H. L.....	10	Moore, Ross L.....	1
Fowler, Harold.....	10	Niles Car & Manufacturing Co.....	2250
Foward, C. B.....	2	Noll, Edward A.....	150
Flynn, J. P.....	5	Nicola, B. D.....	5
Fritzsche, H. E.....	10	Ott, A. L.....	10
Frantz, Edward L.....	50	Offeldt, B. F.....	1
Graver, C. Lee.....	10	Pacx, Dr. A.....	50
Green, J. S.....	10	Pierce, F. L.....	50
Griffin, Mrs. P. E.....	4	Paisley, J. A.....	25
Grady, Patrick.....	10	Prentiss, F. F.....	100
Geib, George P.....	5	Patterson, Robert W.....	2
Gilbert, W. R.....	10	Peabody, O. E.....	5
Gilbert, G. R.....	5	Pendergast, F. A.....	10
Gimmil, W. D.....	10	Pendleberry, T. F.....	5
Gates, Mrs. Etta L.....	5	Price, A. M.....	10
Graver, A. M.....	5	Randall, J. E.....	50
Gilliam, Charles B.....	5	Ruby, O.....	10
Gill, K. F.....	50	Robinson, Allen J.....	5
Hyde, Edward P.....	24	Ruth, Mrs. H. R.....	2
Hawley, D. R.....	15	Sayle, W. D.....	50
Henry, A. S.....	10	Sanchetta, Bianco.....	25
Huntington, John.....	20	Sanchetta, Nelly.....	1
Huffman, L. F.....	10	Schaedel, H. F.....	5
Harman, F. W.....	2	Shirley, O. M.....	5
Hager, W. M.....	20	Soukup, Joseph.....	5
Horn, C. A.....	5	Strong, J. M.....	10
Hope, Frank G.....	5	Strong, L. P.....	10
Hurlburt, W. G.....	15	Svobody, F. J.....	10
Heil, Thomas, jr.....	1	Salmon, Joseph.....	10
Harris, F. W.....	5	Strong, E. E.....	20
Hart, S. W.....	20	Smith, G. W.....	1
Herrigan, E. M.....	1	Sagar, B. E.....	3
Ingersoll, Charles B.....	20	Sutherland, Marg.....	3
Jennings, J. G.....	25	Spahn, Thomas.....	5
Jennings, I. L.....	20	Tobin, R. L.....	5

Preferred stock—list of stockholders of the Engel Aircraft Co.—Continued.

	Number of shares.		Number of shares.
Tower, George E.....	5	Wilcox, H. P.....	5
Tillinghast, E. P.....	10	Ward, C. W.....	20
Thomas, Charles S.....	100	Weinger, W.....	2
Tubman, Dr. T. H.....	5	Woodward, A. H.....	4
Thomas, T. E.....	50	Watkins, John.....	5
Thomas, W. A.....	50	Wilson, P. P.....	25
Vande Boe, Mary S.....	20	Wiltsie, C. H.....	5
Vams, R.....	1	Wilson, Mrs. A. P.....	2
Vogel, Henry.....	8	Zillmer, A. F.....	3
Woodford, W. R.....	75		
Wilson, W. G.....	50	Total.....	5,160
Wurth, William.....	2		

STATEMENT OF MR. WALTER D. SAYLE.

The CHAIRMAN. What is your business?

Mr. SAYLE. Manufacturer.

The CHAIRMAN. Where are you located?

Mr. SAYLE. My personal office is at Cleveland, Ohio.

The CHAIRMAN. What is the name of the company with which you are associated?

Mr. SAYLE. In this particular transaction?

The CHAIRMAN. Yes.

Mr. SAYLE. The Engle Aircraft Co., of Niles, Ohio.

The CHAIRMAN. Where are the factories of the Engle Aircraft Co.?

Mr. SAYLE. Niles, Ohio.

The CHAIRMAN. What position do you occupy in that company?

Mr. SAYLE. President and general manager.

The CHAIRMAN. How long have you occupied that position?

Mr. SAYLE. Since January 21.

The CHAIRMAN. Of this year?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Are you manufacturing aircraft on account of the Aircraft Production Board?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. You have been doing so for about how long?

Mr. SAYLE. That is a pretty hard question to answer. Do you mean when we commenced to ship?

The CHAIRMAN. No. When did you begin negotiations with the Aircraft Production Board looking to the manufacture of aircraft?

Mr. SAYLE. Negotiations were begun, according to my recollection, early in 1917.

The CHAIRMAN. When was your first contract made?

Mr. SAYLE. The contract was given us—I do not want to answer that question because I can not answer it accurately.

The CHAIRMAN. These questions are just approximate.

Mr. SAYLE. I should say it was about July or August.

Senator NEW. Of 1917?

Mr. SAYLE. 1917. I want to reserve the right to change that, because I did not come prepared to answer that.

The CHAIRMAN. When was your company organized?

Mr. SAYLE. The organization was started in October, 1916—Engel, Patterson & Baker, a copartnership.

The CHAIRMAN. For the manufacture of aeroplanes?

Mr. SAYLE. For the manufacture of aeroplanes; yes, sir.

The CHAIRMAN. That was the Mr. Baker to whom you referred some time ago?

Mr. SAYLE. H. D. Baker was the brother of the Secretary of war.

The CHAIRMAN. What are his initials?

Mr. SAYLE. H. D. B.

The CHAIRMAN. Will you state, in a general way, what contracts, if any, subsequent to the beginning of negotiations with the Aircraft Board here have been made out to the Engel Aircraft Co.?

Mr. SAYLE. Up to the present time, you mean?

The CHAIRMAN. Yes.

Mr. SAYLE. Our first contract was for 100 sets of J. N.-4-D's.

The CHAIRMAN. Spares?

Mr. SAYLE. Yes, sir; spares. That was increased from time to time until we finally had 1,200 sets. Those 1,200 sets have been shipped. They were shipped in March, April, May, and June.

The CHAIRMAN. Of this year?

Mr. SAYLE. Of this year; yes, sir.

The CHAIRMAN. When?

Mr. SAYLE. March, April, May and June.

Mr. Walden was the negotiator. He gave us a preliminary contract for 1,000 De Havilands. The contract was not completed. It was what they call a supplementary contract for 1,000 De Havilands.

The CHAIRMAN. When you say "De Havilands" do you mean spare parts?

Mr. SAYLE. Spare parts. Then this trouble came up on account of the relationship between H. D. Baker and the Secretary of War, and it was canceled.

The CHAIRMAN. Just one moment. You had the contracts which you have just mentioned at the time of the trouble which you say arose on account of Mr. Baker's connection with the company. What was that trouble to which you referred?

Mr. SAYLE. There was a relationship between H. D. Baker and the Secretary of War, they being brothers.

The CHAIRMAN. You say, in other words, that this contract for 1,000 De Haviland spares was canceled?

Mr. SAYLE. All contracts were canceled.

The CHAIRMAN. Those completed and uncompleted?

Mr. SAYLE. There were no completed contracts at that time.

The CHAIRMAN. You have given us the date when business was commenced at Niles, Ohio. The copartnership, if I understood you rightly, consisted of three men—or was it a corporation?

Mr. SAYLE. The copartnership was organized in October, 1916. The organization of the Engel Aircraft Co. was started about January or February of 1917. It was incorporated in August, 1917.

The CHAIRMAN. To succeed the partnership?

Mr. SAYLE. To succeed the partnership; yes, sir.

The CHAIRMAN. What was the capital stock of that company?

Mr. SAYLE. The capitalization, the final capitalization, was to be \$1,000,000 of the preferred stock and \$2,000,000 of the common stock.

The CHAIRMAN. How much was issued at that time?

Mr. SAYLE. None was issued at that time.

The CHAIRMAN. None was issued?

Mr. SAYLE. No, sir.

The CHAIRMAN. Was Mr. Baker one of the stockholders of the company when the change was made?

Mr. SAYLE. Mr. Baker was to be a stockholder of the company and have his pro rata third interest in the partnership in the common stock it was to get.

The CHAIRMAN. Was it after the corporation was organized that this contract for 1,000 De Havilands was obtained?

Mr. SAYLE. Yes, sir. The J. N.-4-D's were the first contracts.

The CHAIRMAN. That was for the corporation?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. You spoke of trouble regarding Mr. H. D. Baker. Do you mean by that that because the Secretary of War was informed of the existence of the contract between the Government and this company in which his brother was interested he ordered the contract canceled?

Mr. SAYLE. I have no knowledge of why it was done, or, at least, how it was called to his attention. I only know what happened.

The CHAIRMAN. What you refer to as the trouble was the relationship coupled with the fact that the contract, as you understood it, because of that, was canceled?

Mr. SAYLE. That is what I understood; yes, sir.

Senator REED. Do you mean by that that there was public criticism?

Mr. SAYLE. Public criticism in Washington and in the press all over the country.

The CHAIRMAN. What became of Mr. Baker's interest in the concern about the time of the cancellation of the contract?

Mr. SAYLE. We received notice of the cancellation of the contract on January 8. On January 22 we called a meeting of the directors. Mr. H. D. Baker realized that his position as president of the organization was embarrassing the Government in their aircraft production, or in the pursuit of the war, so he tendered his resignation as president and general manager and director, and he was paid \$15,000 by the company for the surrender of all his interests in the organization, stock and everything, without profit to him.

The CHAIRMAN. Did that represent what he had put into it?

Mr. SAYLE. That represented what he had put into it in cash and services.

The CHAIRMAN. And for that consideration, you say, he retired from this position and also transferred all of his interests in the company to his associates?

Mr. SAYLE. Everything.

The CHAIRMAN. Absolutely?

Mr. SAYLE. Absolutely.

Senator NEW. You say that \$15,000 represented what he put in in cash and services. Can you tell how that was divided; how much of it was cash?

Mr. SAYLE. I do not know that, sir. I do not suppose anybody would know, except as a general estimate. Engel himself had started the aeroplane company. I think it was at Depew. It was near Buffalo. Anyway, he had failed. They went down there and purchased his entire assets.

Senator REED. Whom do you mean by "they?"

Mr. SAYLE. Engel, Patterson, and Baker.

Senator REED. Who was it that failed?

Mr. SAYLE. Engel failed.

Senator REED. He could not purchase out very much, then,

Mr. SAYLE. Patterson and Baker did that. They took Engel along with them as the technical brains of the organization to complete it.

The CHAIRMAN. That was before?

Mr. SAYLE. That was in October, 1916; yes, sir.

The CHAIRMAN. Now, since that time, what contracts have been made with your company by the Aircraft Production Board?

Mr. SAYLE. In April of this year we had a contract executed for 500 De Havilands.

The CHAIRMAN. Spares?

Mr. SAYLE. Spares; yes, sir.

The CHAIRMAN. Anything else?

Mr. SAYLE. That is all.

The CHAIRMAN. Do those contracts include——

Mr. SAYLE (interrupting). Pardon me; I did not understand what you meant by "anything else." Later we received a contract for 10 complete JN-4-D planes and, I think, about two sets of spares.

Senator NEW. Completed planes?

Mr. SAYLE. Completed planes, not including power plant.

The CHAIRMAN. Have you a contract for landing gears?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. What is the date of this contract?

Mr. SAYLE. Landing gears have been included in all our contracts.

The CHAIRMAN. They constitute a part of the spares. Have you any contracts for landing gears independent of the spares, or, extras I should say?

Mr. SAYLE. No, sir; we have not received a contract for landing gears only.

The CHAIRMAN. You manufacture at your plant the wheels for the landing gears?

Mr. SAYLE. No, sir; we buy the wheels.

The CHAIRMAN. Do you buy any from any concern in Geneva, N. Y.?

Mr. SAYLE. I think so; yes, sir.

The CHAIRMAN. You do not manufacture those in competition with the Geneva firm, or other firms?

Mr. SAYLE. No, sir.

The CHAIRMAN. Now, tell the committee whether Mr. H. D. Baker, directly or indirectly, had an interest in or was connected with the Engel Co. or any of its contracts since the purchase by the company of his interest and his retirement.

Mr. SAYLE. Mr. Baker has absolutely no financial interest, and the only interest that he has taken in it is the interest that he took about February 1. At that time I was called down to Washington. The proposition was entirely new to me, and I asked him to come along with me to guide me. I explained to Mr. Montgomery, with whom we were dealing at that time, that Mr. Baker was down here as an adviser to get me started on the airplane work, and that was the last time that Mr. Baker or his name has been connected with any of our negotiations.

The CHAIRMAN. Does he own over his own name, or in the name of anybody for him, any shares of the stock of the Engel Co. or any of the other concerns with which the Engel Co. is identified?

Mr. SAYLE. Absolutely nothing, not a single share of stock or in any other way whatsoever.

The CHAIRMAN. Were either of the contracts renewed which were canceled at the time that this question first presented itself?

Mr. SAYLE. The contract for the 1,200 JN 4 D's was renewed approximately the middle of February, or along there. I could get you those exact dates.

The CHAIRMAN. About the middle of February?

Mr. SAYLE. About the middle of February; yes, sir.

The CHAIRMAN. Were they renewed for 1,200 or for 500?

Mr. SAYLE. 1,200 JN 4 D's.

The CHAIRMAN. Were they renewed at the same price?

Mr. SAYLE. They were renewed at the same price. The contracts were just reinstated, so to speak. To tell the truth, the Government could not cancel it. It was a bona fide contract with the Government, just as bona fide a contract as if it were between you and me.

The CHAIRMAN. As a matter of fact, they were canceled, apart from the legal authority?

Mr. SAYLE. Yes, sir; they were canceled.

The CHAIRMAN. And it required your presence down here after Mr. Baker retired, to obtain a renewal of that contract?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. And the renewal was made in the shape of another contract or another paper?

Mr. SAYLE. I think only a telegram.

The CHAIRMAN. Nothing but a telegram?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Then the contract, as a matter of fact, was suspended, and after Mr. Baker's retirement you went on with it by the authority of the Government?

Mr. SAYLE. Yes, sir; we went on.

The CHAIRMAN. Have you completed your deliveries of the 500 De Haviland spares?

Mr. SAYLE. No, sir; we have not started on delivery yet.

The CHAIRMAN. You have started on production?

Mr. SAYLE. Oh, yes, sir.

The CHAIRMAN. Have you more than one factory engaged in this work?

Mr. SAYLE. No, sir; just one factory.

The CHAIRMAN. At Niles, Ohio?

Mr. SAYLES. Niles, Ohio.

The CHAIRMAN. What was this concern in Depew, N. Y.?

Mr. SAYLE. That was a concern that Engel, who was a flyer for Curtiss, started up to build a flying boat.

The CHAIRMAN. Is he still connected with your company?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Where is Mr. Baker now?

Mr. SAYLE. In Cleveland, Ohio.

The CHAIRMAN. What is his business?

Mr. SAYLE. Well, I really do not know. Baker has held a great many responsible positions, in Cleveland, Lorain, and New York City.

The CHAIRMAN. I did not know but what he was a lawyer.

Mr. SAYLE. No.

Senator REED. What kind of positions?

Mr. SAYLE. He was at one time purchasing agent for the city of Cleveland. He was in Lorain at one time. As I understand it, he was a sort of manager for Tom Johnson down there. Just what his business was in New York City, I am not in a position to tell you.

Senator REED. It was some official position?

Mr. SAYLE. Yes, sir. He is a very bright man.

Senator REED. There are one or two questions that I would like to ask. Do you think that Mr. Baker, in his withdrawal from this corporation, received any more than the actual value of his contribution in money or time?

Mr. SAYLES. Not a penny.

Senator REED. Did he receive a fair equivalent for his contribution in money and time?

Mr. SAYLE. If it had been my own, I would have said no; I would not have sold for that value.

Senator REED. What would you have sold out for, if you had been going to get out, as Mr. Baker was?

Mr. SAYLE. Senator, that is a pretty hard question to answer.

Senator REED. What would you have sold out for if you had no Government contract?

Mr. SAYLE. If I had been called upon to get out of my own volition, \$50,000 would not have taken it.

Senator REED. But suppose you had no Government contract; what would it have been worth?

Mr. SAYLE. A concern without contracts at all is not worth anything.

Senator REED. How much money was actually paid into the corporation at the time it was organized?

Mr. SAYLE. The corporation?

Senator REED. Yes.

Mr. SAYLE. No money was paid at the time it was organized.

Senator REED. Was any money paid in afterwards? I mean before Mr. Baker went out.

Mr. SAYLE. Just how much was paid in before Mr. Baker went out, I could not say, but I will guarantee it was \$400,000.

Senator REED. That was paid in from the sale of preferred stock?

Mr. SAYLE. Yes, sir.

Senator REED. Was there anything paid for the common stock?

Mr. SAYLE. The common stock was paid out to take over the interest of the trio, Engel, Patterson, and Baker.

Senator REED. Were those interests considered as equal?

Mr. SAYLE. I think they were.

Senator REED. So that at most there was \$45,000 contributed in money. That is, there was \$45,000 invested in money and in services, which included the value of these contracts, and for that \$2,000,000 of common stock was to be issued to three men. That is the situation, is it not?

Mr. SAYLE. If you want to figure it that way, yes.

Senator REED. There is no other way to figure it, is there?

Mr. SAYLE. Yes, sir.

Senator REED. Now, let us see. These men went into a partnership. They organized a corporation. This corporation got some Government contracts, and after they had the Government contracts one of the partners, who owned a one-third interest, sold his interest for \$15,000. Estimating the other two at equal amounts, that would make a total of \$45,000. That is correct so far, is it not?

Mr. SAYLE. I think your basis of reasoning is correct; yes, sir.

Senator REED. Yes. Well, I am trying to get the correct basis. Now, it was proposed to capitalize this corporation by issuing common stock in the amount of \$2,000,000 and preferred stock in the amount of \$1,000,000; is that right?

Mr. SAYLE. That is right.

Senator REED. And the common stock was to be turned over to these three incorporators, each of them to get the same amount; in other words, each got one-third.

Mr. SAYLE. Yes, sir; that is right.

Senator REED. Then you proposed to sell the preferred stock and in that way get capital with it to carry on the enterprise; that is right?

Mr. SAYLE. That is right.

Senator REED. Now, as a matter of fact, what physical properties did the corporation have transferred to it at the time of the organization?

Mr. SAYLE. Is that question addressed to me?

Senator REED. Yes.

Mr. SAYLE. I can not give that information, but there was this flying boat that I have spoken of.

Senator REED. Did it own real estate?

Mr. SAYLE. Oh, no, sir.

Senator REED. It owned no real estate?

Mr. SAYLE. No.

Senator REED. Was any cash put into the corporation by the three incorporators at the time it was incorporated?

Mr. SAYLE. No, sir.

Senator REED. Did it have leasehold interests?

Mr. SAYLE. No, sir.

Senator REED. What did it have?

Mr. SAYLE. The three men had the flying boat and the machinery that they brought with them.

Senator REED. What was that machinery, and it was brought from where?

Mr. SAYLE. From Depew, N. Y.

Senator REED. How much did they pay for that machinery from Depew?

Mr. SAYLE. I do not know.

Senator REED. What machinery was it?

Mr. SAYLE. Machinery for the flying boat—machinery for manufacturing.

Senator REED. Lathes and things of that kind?

Mr. SAYLE. Yes, sir.

Senator REED. Do you know what it cost?

Mr. SAYLE. No, sir.

Senator REED. Do you know what they paid for it?

Mr. SAYLE. No, sir.

Senator REED. Was this flying boat a completed thing?

Mr. SAYLE. It was a completed thing.

Senator REED. Who had created this boat?

Mr. SAYLE. Engel.

Senator REED. He was to get a one-third interest for that flying boat?

Mr. SAYLE. Yes, sir.

Senator REED. And the patents?

Mr. SAYLE. Yes, sir.

Senator REED. That was Engle's contribution?

Mr. SAYLE. All those things were owned by the three. I do not understand that Engel or Patterson had an individual interest.

Senator REED. When Engel, Baker, and Patterson formed the copartnership, what did Engel put into the partnership? He put in this boat, did he not? It was his invention, was it not?

Mr. SAYLE. Yes, sir; but they bought this boat from the Engel receiver down at Depew, N. Y.

Senator REED. How much did they pay for it?

Mr. SAYLE. I do not know.

Senator REED. Did you ever hear?

Mr. SAYLE. I never heard and never asked.

Senator REED. You have no idea?

Mr. SAYLE. Absolutely not.

Senator REED. Engel had made this boat. He had gone into the hands of a receiver. Then a copartnership was organized and he was one of the partners, and they purchased from him the boat and the patents?

Mr. SAYLE. I do not know about the patents.

Senator REED. Do you know whether your concern has patents on the thing?

Mr. SAYLE. They have no patents. I do not think these things can be patented. The Government allows a certain amount for a model boat. I think it is \$40,000 or \$50,000.

Senator REED. If the Government is making it, that is true, but this boat was made before the Government was in that business.

Mr. SAYLE. Yes, sir.

Senator REED. Your answer does not seem to get us any place. There were patents that had been issued upon at least parts of the aeroplane. Do you know whether any such patents as those had been issued on this flying boat which Engel and these other gentlemen owned?

Mr. SAYLE. I do not know of patents issued on any of it, because—

Senator REED. So far as you know, what was paid in by Mr. Engel was an unpatented, unprotected flying boat, which had been built by Mr. Engel when he was a member of a corporation and had then been sold by a receiver of that corporation and had been bought by Mr. Baker, Mr. Engel, and Mr. Patterson. Now, that was put in as a part of the assets of the corporation. Do you know what value they put it in at?

Mr. SAYLE. I do not know that.

Senator REED. What else did they have to put in and did they put in, in fact, I mean?

Mr. SAYLE. I do not know that there was anything else put in.

Senator REED. But that boat?

Mr. SAYLE. Except the contract that they had with the Niles Car Manufacturing Co. for the purchase of the property down there.

Senator REED. What property was that?

Mr. SAYLE. At Niles, Ohio.

Senator REED. What was this property?

Mr. SAYLE. The Niles Car Manufacturing Co.

Senator REED. They had an option on the property?

Mr. SAYLE. They had an option on the property.

Senator REED. Do you know how much that was for?

Mr. SAYLE. That was for \$450,000—\$225,000 of preferred stock and \$225,000 of common stock.

Senator REED. That is to say, this Niles Car Manufacturing property was to be taken over by the Aircraft Corporation and was to be paid for with \$225,000 of the preferred stock of the Aircraft Corporation and \$225,000 of the common stock. Now, in view of the fact that that was all to be paid for out of the stock of the Aircraft Corporation, of course it was not a contribution to the capital stock. That property was not there to turn into the corporation as original capital. It was something that the corporation purchased after it had been incorporated, and paid for by the issuance of its capital stock. That is how that comes out, is it not?

Mr. SAYLE. I do not know that I will agree with you there, Senator.

Senator REED. All they had was a contract for the purchase of this property, and they did not pay for it in money, but paid for it in the manner you have stated, by the issuance of capital stock—common and preferred; that is correct, is it not?

Mr. SAYLE. Yes, sir.

Senator REED. Now, what else did they have at the time they organized this corporation?

Mr. SAYLE. I guess you have stated it all, except brains and energy.

Senator REED. Did they have at that time any Government contracts?

Mr. SAYLE. No, sir.

Senator REED. Well, the brains and energy were tolerably well capitalized, were they not, in the shape of \$2,000,000 of common stock?

Mr. SAYLE. No, sir; they were not.

Senator REED. Was this an Ohio corporation?

Mr. SAYLE. Yes, sir.

Senator REED. Is there any law in Ohio that provides for the payment of stock in brains and energy, or does the law require it to be paid for in money?

Mr. SAYLE. Well, the organization passed the blue-sky law; that is the only way I can answer that question.

Senator REED. With all due respect, I think your law would have to reach the blue sky. That is all I have to ask.

The CHAIRMAN. Let me ask you a question that I overlooked. Were you requested by any of the representatives of the Government to enter into what is called the cross-license agreement?

Mr. SAYLE. No, sir. May I explain that?

The CHAIRMAN. Certainly.

Mr. SAYLE. It has been explained to me, because I had nothing to do with it at that time. Mr. Baker carried it on. As I stated to you, personally, if you remember, Mr. Baker tried to get a contract at Washington through Col. Waldon, who paid no attention to him at all. That was the time that he started in on the Niles Car Manufacturing plant. It was intimated to him down here that he could not get a contract with the Government unless he showed ability to produce. That is the time that he got the Niles Car plant, and then when he got that he found out that he could not get the drawings, so he went down to the Curtiss Co.

Senator REED. This Niles contract for the Niles Car Manufacturing Co., or whatever you call it, was not obtained at all until after the corporation had been organized?

Mr. SAYLE. Yes, sir; it was obtained before it was organized. Baker had a contract with them before the company was organized, and tried to get a contract with the Government before the company was organized, and the Aircraft Corporation would not listen to him, and then he had to organize a company to take over the Niles plant, and show the Aircraft Production Board that he had the physical property in which to complete his contract.

The CHAIRMAN. He had an option, and he transferred it into the arrangement that you have made, and got possession?

Mr. SAYLE. I will be glad to bring those papers. They are very voluminous, however.

Going back to your question, Senator Thomas, Mr. Baker saw that he could not make any headway, because he did not have drawings, so he went down to the Curtiss plant and laid down \$2,500 for these drawings, and he got them. Well, the minute he got his Government contract he was entitled to these drawings, so that he demanded from the Curtiss Co., and received from them, \$2,000 of the \$2,500, so that it cost the Engel Co. only \$500 for the complete drawings of the JN4D.

The CHAIRMAN. Why was he required to leave \$500 with the Curtiss Co.?

Mr. SAYLE. I can not answer that question. It is something pertaining to the matter of——

The CHAIRMAN. The planes?

Mr. SAYLE. I wondered why he was asked to leave \$2,500 there, but there was something pertaining to the aircraft organization that made him pay that amount of money.

The CHAIRMAN. Is there any cross license agreement now existing between the Engel Aircraft Corporation and the Aircraft Manufacturing Association?

Mr. SAYLE. Not that I know of.

The CHAIRMAN. What about the \$2,500 deposit?

Mr. SAYLE. I understood that was canceled when we received the contract.

The CHAIRMAN. To the extent of \$2,000?

Mr. SAYLE. Yes.

Senator NEW. You say that Mr. Baker came down to Washington with you?

Mr. SAYLE. Yes, sir.

Senator NEW. When was that?

Mr. SAYLE. May I explain the whole situation?

Senator NEW. Yes.

Mr. SAYLE. Before I was connected with the airplane plant they received from Mr. Gee a tentative contract for 1,000 De Havilands, which was signed about January 8. Then they called us down here to Washington to reopen the De Haviland contract.

Senator NEW. You say they called "us."

Mr. SAYLE. I mean the Engel Aircraft Co. I, as president of the company, had to come down, but I knew nothing about the former negotiations, so that I requested Mr. Baker to come down with me. I took him up to the Aircraft Production Board and explained to Mr. Montgomery, the lawyer there, with whom we did business, that Mr. Baker was here as my adviser, and this would be his last trip, as I hoped to get in complete touch with the situation on that trip; and it was his last trip. That was early in February.

Senator NEW. Of this year?

Mr. BAKER. Yes, sir; of this year.

The CHAIRMAN. Mr. Sayle, will you attach to the record, when it is sent to you for correction, a list of the shareholders of the Engel Aircraft Co.?

Mr. SAYLE. A complete list?

The CHAIRMAN. Yes, sir.

Mr. SAYLE. Yes.

Senator REED. To whom was Mr. Baker's stock transferred?

Mr. SAYLE. To the company.

Senator REED. It was transferred back to the company?

Mr. SAYLE. To the company; yes, sir. It stands now in the name of the company.

The CHAIRMAN. I think that is all.

(Whereupon, at 4 o'clock p. m., the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, JULY 26, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 3 o'clock p. m., pursuant to the call of the chairman in the committee room, Capitol Building, Senator New presiding.

Present: Senators New and Reed.

STATEMENT OF CAPT. RILEY SCOTT.

Senator NEW. Captain, state your name and address to the stenographer.

Capt. SCOTT. Riley Scott, technical section, office of the Director of Military Aeronautics, Washington, D. C.

Senator REED. What is your rank?

Capt. SCOTT. I am a civilian. I am a West Point graduate and have been in the service. I am now an aeronautical mechanical engineer.

Senator NEW. You were formerly in the Army and a graduate of the Military Academy?

Capt. SCOTT. Yes, sir.

Senator NEW. Of what year?

Capt. SCOTT. 1904.

Senator NEW. You served in the Army how long?

Capt. SCOTT. Four years.

Senator NEW. What rank did you have when you left?

Capt. SCOTT. First lieutenant.

Senator NEW. How did you happen to leave the Army?

Capt. SCOTT. Lieut. Selfridge, who was the first man killed in mechanical flight, was my chum, and he interested me at that time in aviation.

Senator NEW. You resigned from the service when?

Capt. SCOTT. At the time that Orville Wright was flying at Fort Myer.

Senator NEW. Did you become associated with the Wrights?

Capt. SCOTT. I was an aide to Wilbur Wright for a time during the Hudson-Fulton Exposition and have known both of the Wright brothers since that time.

Senator NEW. What has been your business since that time?

Capt. SCOTT. I have specialized on the airplane as an instrument of war, especially its rôle as a bombing machine.

Senator NEW. You say that you have specialized on those subjects. In what connection and capacity?

Capt. SCOTT. I happen to have invented the first bomb sight and to have dropped the first bomb in the history of aviation. Then I went to France in 1911 and won all of the Micheli prizes for bombing. I then went to Germany in 1912 and dropped bombs there, which were probably about the first which were dropped in Germany.

Senator REED. Were you operating there under the German Government?

Capt. SCOTT. By invitation of the German Government.

Senator REED. And in France under the French Government?

Capt. SCOTT. I was competing for a prize offered by Monsieur Micheli.

Senator REED. Of course both of these occurrences you have spoken of occurred before the European war?

Capt. SCOTT. In 1911 and 1912.

Senator REED. Was this Micheli prize which was offered in France open to the world?

Capt. SCOTT. Yes, sir.

Senator REED. What was the prize for?

Capt. SCOTT. Accuracy in bomb dropping and the most scientific instruments for bomb dropping.

Senator REED. Are you an aviator yourself?

Capt. SCOTT. I learned to fly in France, but do not fly at present.

Senator REED. Were you running the machine as aviator when these bombs were dropped on these two occasions you have spoken of—that is, in France and Germany?

Capt. SCOTT. No, sir; I was then a passenger operating the bombing instrument.

Senator NEW. Since the European war broke out have you been abroad?

Capt. SCOTT. Yes, sir; I have. When the war broke out I cabled my services to both France and England. Neither country accepted the services, on account of my not being on the ground. I then went abroad on my own responsibility for the purpose of seeing and learning as much as I could about the rôle that the airplane was playing in the great war, especially in the field of bombing. By good luck I was able to get into 14 European countries, 9 of which were belligerents on both sides of the conflict.

Senator NEW. Did you get into Germany?

Capt. SCOTT. Germany, Austria, Hungary, Serbia, Bulgaria, Turkey and Asia Minor, France, England, Italy, and Belgium.

Senator NEW. With what opportunity for observation?

Capt. SCOTT. They happened to be most excellent on account of my knowing most of the old aviators of those various countries, having met them at various times in Europe.

Senator NEW. Captain, you have been back here about how long?

Capt. SCOTT. About two years.

Senator NEW. Have you recently discharged any commissions or had any connection with the aviation section here of the Signal Corps?

Capt. SCOTT. For over a year I have been employed as an aeronautical mechanical engineer, and my work has been wholly concerned with aeroplane bombing.

Senator REED. Who were you employed by?

Capt. SCOTT. The air division of the Signal Corps.

Senator REED. Who was at the head of it?

Capt. SCOTT. Gen. Squier was then the head.

Senator REED. Where were you located?

Capt. SCOTT. My headquarters have been at Langley field, Hampton, Va., but I have been traveling a great deal to various fields and factories.

Senator REED. Under the directions of your employers?

Capt. SCOTT. Under official orders.

Senator NEW. Have you recently made a trip to Dayton under official orders?

Capt. SCOTT. I was and was there two weeks for the purpose of studying and reporting on the D. H. 4 airplane as a bombing machine.

Senator NEW. Have you made such a report?

Capt. SCOTT. I have but it has not yet been submitted. I have written it.

Senator NEW. Without asking you to define the character of the report which has not yet been submitted to the department, I will ask you what has been the result in your own mind of the inspection of the De Haviland?

Capt. SCOTT. I came to the conclusion after a cursory inspection that there was something radically wrong with the machine, and after making a minute inspection I am of the firm opinion that the machine is totally unfit for the purpose for which it was designed.

Senator REED. Namely, what?

Capt. SCOTT. As a bomber and as a combat machine.

Senator NEW. Why?

Capt. SCOTT. For the reason because the design and workmanship of this machine are so faulty I consider it unsafe for bombing, especially when the bombs are carried suspended from the rings, as at present.

Senator REED. Well, that is a conclusion, but tell us why.

Capt. SCOTT. A few of the defects are indicated on the photographs which are herewith submitted.

Senator REED. What are those defects? Can you not put your criticism in the kind of language which anybody who understands anything about the technical nature of airplane manufacture or operation can understand?

Capt. SCOTT. The longerons, a most vital part of the machine, are entirely of spruce and are scarcely larger in cross section than the ash longerons of other lighter machines.

Senator REED. What conclusion do you draw from that?

Capt. SCOTT. That they should use a stronger wood than spruce, especially in such a heavy machine.

Senator NEW. For that particular structural part?

Captain SCOTT. For that particular structural part.

Senator REED. You say that the machine as now made with spruce is inefficient in strength at the part you spoke of, the longerons?

Capt. SCOTT. Decidedly so.

Senator REED. What are the longerons? Can you describe them so that the layman will understand what it is?

Capt. SCOTT. The "longeron" may be described as the backbone of the machine. There are usually four longerons running from the engine section to the tail, about which are formed the body of the machine. These longerons perform the same function in the airplane that the back bone of a man performs in his anatomy. In other

words, the various fittings and attachments for the motor, for the wings, and for the rudders are attached and depend upon these longerons.

Senator REED. They form the chief strengthening supports for what is called the fuselage——

Capt. SCOTT. Yes, sir.

Senator REED. Or body of the plane?

Capt. SCOTT. Yes, sir.

Senator REED. You say they are deficient in strength. Now, why do you say they are deficient in strength?

Capt. SCOTT. In the first place, the wood itself is not that usually used for these parts. If, taken in connection with the fact that all fittings without exception are attached to the longerons with bolts passing through the wood of the longeron—these bolts are awfully closely spaced and pass through both laterally and vertically, thereby destroying the strength of the wood.

Senator REED. Now, if I understand you, you say, first, that the spruce, being the material of which these longerons are made, is a wood that is too weak considering the size of the pieces. It is too weak in itself, and, second, that it has been further weakened by boring holes of bolts through it and putting bolts through at close intervals?

Capt. SCOTT. Yes, sir.

Senator REED. So that as a result of the two elements, you say that the longerons are too weak a part of the machine?

Capt. SCOTT. Yes, sir.

Senator REED. That is a conclusion. Let me follow it a minute. You said a minute ago that the longerons were made of spruce, whereas the material generally employed was ash.

Capt. SCOTT. Yes; there are other stronger woods.

Senator REED. Now where is ash or other stronger wood employed; in what factories or countries?

Capt. SCOTT. I think in every other type of machine in this country and generally abroad.

Senator REED. You think then that these De Haviland 4's are the only machines that are built that are to do practical flying and work on the war front—I suppose of course you would include that limitation you would not include every kind of machine that has ever been constructed?

Capt. SCOTT. I referred to two machines in production.

Senator REED. This is the only machine you know of that does not employ ash or some equally strong wood some wood that is stronger than spruce in these parts which are called the longerons?

Capt. SCOTT. Yes sir; not only in this country but abroad as well.

Senator REED. I want to come to the second element of weakness. You spoke about the bolts these longerons having been bored through and bolts inserted and the borings and of course the bolts being sometimes close together.

Capt. SCOTT. Closely spaced, both laterally and vertically, the holes alternating sometimes.

Senator REED. Is that kind of construction peculiar to the De Haviland 4 as made here in this country?

Capt. SCOTT. It is and I have seen no other machine where the longerons were perforated by these holes.

Senator REED. Other machines fasten their bolts how? If they do not make bolt holes how do they fasten them?

Capt. SCOTT. The fittings are called clips and are placed around the wood instead of being fastened by bolts.

Senator REED. How are they attached to the wood so as to make them firm?

Capt. SCOTT. By being placed entirely around the wood and gripping instead of being fastened by bolts.

Senator REED. What is the process of making them grip; by a set screw, or by heating them and putting them on hot?

Capt. SCOTT. They are put on cold and are held in place by bolts through metal but not through wood.

Senator REED. These bolts then press against the wood, do they not? I understand you to mean from the illustration you have made that this clip or metal is placed against the wood, and then it is drawn tightly against the wood by means of a screw going through the metal parts and drawing them together, grasping the wood, but not penetrating the wood?

Capt. SCOTT. Yes, sir.

Senator REED. You say that is the only kind of construction?

Capt. SCOTT. That is the standard construction?

Senator REED. Are there other planes, however, in common and general use in this country where they bore through the parts?

Capt. SCOTT. Not to my knowledge, unless it be the Bristol, which I have not closely examined.

Senator REED. The Bristol fighter. That is a machine we understand has been condemned.

Capt. SCOTT. Yes, sir.

Senator REED. You say these parts are weak, and you have given us your reasons for saying that they are weak. Have you ever seen them tested under a load when they gave way?

Capt. SCOTT. That is being done at present, but I was not able to see the test.

Senator REED. Your conclusions that you have given us are deductions from the conditions which you find, and not from the actual breaking of the planes?

Capt. SCOTT. The conclusions are based on a general fundamental knowledge of airplane construction, and from an examination of the records of several machines which have fallen with fatal results.

Senator REED. Do you know that any of these machines, or have you good reason to assume and conclude that any of these machines fell because of breakage, which was the result of these particular weaknesses which you have described?

Capt. SCOTT. In one case in particular into which I inquired, the wings were seen to leave the plane in midair, first one wing and then the other, which was apparently due to the fact that the fittings which held the wings to the fuselage gave way. The records show that the longeron broke in practically every instance at the bolt holes, which one would naturally expect.

Senator REED. You say that the wings left the body. Do you connect ~~that~~ fact up with the weaknesses in the longerons which you have described?

Capt. SCOTT. An examination afterwards showed that the fittings attached to the longerons, by means of bolts, had given away.

Senator REED. You mean the fittings that united the fittings to the longerons?

Capt. SCOTT. They had given away.

Senator REED. Had the bolts given away or the longerons broken?

Capt. SCOTT. The longerons had broken at the bolt holes.

Senator REED. Have you other reasons than those that you have just given to sustain the question of the weaknesses? I want to stick to this particular weakness we are now discussing. Are there any other tests that you have known that have indicated the weakness of the longerons?

Capt. SCOTT. In another instance into which I inquired, the machine was compelled to make a forced landing in rough ground, receiving a considerable jolt upon touching the earth. The whole motor section, including the motor and the propeller, broke off and turned at right angles to the axis of the machine. All four longerons broke at a place where there were a number of bolt holes.

Senator REED. At substantially the same point in the longeron?

Capt. SCOTT. At exactly the same cross section of the fuselage.

Senator REED. Do you know of other instances than these two?

Capt. SCOTT. Not personally.

Senator REED. Have you heard of other cases of a similar nature?

Capt. SCOTT. I was told at the Wilbur Wright field that in every case where there had been a serious fall the aviator had been killed, and that the fuselage was usually crushed like an egg shell. I examined, however, the wreckage of only two machines, of which I have spoken.

Senator REED. Who gave you this information you have just imparted?

Capt. SCOTT. The principal flying officers at the Wilbur Wright field.

Senator REED. Can you tell me who they were?

Capt. SCOTT. Maj. Muhlenberg, chief of the testing department; Capt. Schroeder, in charge of flying in the testing department; Lieut. Foote, one of the best De Haviland 4 fliers at the field, and Lieut. Tabuteau, an old experienced French flyer now stationed at this field as a technical expert.

Senator REED. When did these gentlemen give you this information?

Capt. SCOTT. While I was at the field inspecting the machines and dropping bombs for them.

Senator REED. Approximately when?

Capt. SCOTT. About two weeks ago.

Senator REED. When did this first machine fall that you described a little while ago in which there was a fatality?

Capt. SCOTT. At the Wilbur Wright field.

Senator REED. Who was flying it at the time?

Capt. SCOTT. Lieut. Patterson, a nephew of the National Cash Register Co.'s president.

Senator REED. Do you remember when that fell?

Capt. SCOTT. About a month and a half or two months ago.

Senator REED. When was the second accident that you described?

Capt. SCOTT. About a month ago.

Senator REED. Who fell in that?

Capt. SCOTT. Maj. Ocker, an old experienced flyer.

Senator NEW. Was Maj. Ocker killed?

Capt. SCOTT. No; he was not hurt, except that he is swearing yet about it.

Senator REED. Where is Maj. Ocker?

Capt. SCOTT. At present he is at Wilbur Wright field.

Senator REED. You spoke about the strength of these longerons in connection with the load. Do you know whether the De Haviland 4 was originally planned to carry the weight that is now put upon it?

Capt. SCOTT. The machine was copied from the English De Haviland, which was designed to carry a much lighter motor than the present Liberty motor. Instead of strengthening the machine it is common comment among the flyers that the American De Haviland is considerably weaker than its prototype, the English machine.

Senator REED. And it has to carry a much heavier motor?

Capt. SCOTT. And has to carry a very much heavier motor.

Senator REED. Well, does it not also carry a more powerful motor than the one it was originally planned for?

Capt. SCOTT. It does, and, of course, the high speed of the machine—about 120 miles per hour—adds very considerably to the strains imposed upon the structure.

Senator REED. That is to say, a machine carrying a motor weighing, for illustration, 500 pounds, and going at a rate of 100 miles an hour, does not have anything like the same strain on its parts as the same machine would have if you put in a motor that weighed 800 pounds and ran the machine at 120 miles an hour. Is that right?

Capt. SCOTT. That expresses it exactly.

Senator REED. Have you ever figured out the difference in the strain upon the wings of these planes which you say is due, first, to the increase in the weight of the motor, and, secondly, to the increase in speed?

Capt. SCOTT. I have not personally, but it is common aeronautical knowledge, several authorities having figured all those things out.

Senator REED. What is the rule as to pressure? Is there a rule? I do not know but want to make my question plain. Sometimes the momentum of a body can be ascertained by multiplying the speed of the square of the weight with the square of the speed, if I remember the old rule right. Is there any such rule as that which would tell the pressure on the parts of the machine, or have you not advanced far enough to develop a rule?

Capt. SCOTT. We have. This has been figured out by Dr. Zahm, an eminent American scientist, who has computed tables showing these various strains at various speeds and at various diving angles.

Senator REED. Those tables, of course, you do not carry in your mind?

Capt. SCOTT. No, sir.

Senator REED. But the pressure is very much greater?

Capt. SCOTT. Very much greater. It increased rapidly and is very much greater.

Senator REED. You have spoken of the difference in the load occasioned by the motor. What other load has been put on the De Haviland since it has been adopted by our people?

Capt. SCOTT. The American De Haviland carries approximately the same load in machine guns and bombs that the present English De Haviland carries.

Senator REED. How does the present English De Haviland compare in strength of structure with the American De Haviland?

Capt. SCOTT. It is said to be much stronger. I have not seen the English De Haviland personally.

Senator REED. Do you understand that they have increased the strength of their plane as they have increased the load?

Capt. SCOTT. I have been told so.

Senator REED. Now, if I understand you right, you say that the English De Haviland from which we copied the American De Haviland was planned to carry a lighter load than the American De Haviland, and was a stronger machine than the American De Haviland? Was it also planned at the time it was made to carry a load of bombs? I am speaking now of this type that we copied ours from.

Capt. SCOTT. The later ones were. I am not sure about the first De Havilands.

Senator NEW. Captain, you spoke of the custom here of perforating the longerons for the use of bolts. You showed me a photograph, one of a longeron showing the frequency with which those bolts were put in. Have you a copy of it with you?

Capt. SCOTT. I have a copy in which nine quarter-inch bolts pass through the spruce longeron in a length of 10 inches, which naturally destroys the strength of the longeron at that point.

Senator NEW. Will you submit that copy of the photograph for the records of this committee?

Capt. SCOTT. I will. And also I have with me a section of the longeron showing the manner in which the bolts go through the wood.

Senator NEW. Will you let us also have the section of the longeron?

Capt. SCOTT. Yes, sir.

Senator REED. The photograph that you show; does it contain the same section of the longeron that you are handing us?

Capt. SCOTT. No, sir; the section which I am giving you has only four bolts through the wood.

Senator REED. Exactly, but it is broken off, and I do not know what there was in the broken-off portion. What I am interested in is the size of the longeron at the point where these bolts go through it.

Capt. SCOTT. It is practically of the same cross section as the sample submitted.

Senator REED. Give us the size of this piece of longeron which you say is substantially the size of the longeron shown in the photograph marked E, through which nine quarter-inch bolts pass in the space of 10 inches.

Capt. SCOTT. The cross section of the longeron is about $1\frac{1}{2}$ inches square. It may be that the section shown in the photograph is slightly greater in cross section.

Senator REED. When you say slightly greater, that, of course, is indefinite. Can you state the limits?

Capt. SCOTT. Not over $1\frac{3}{4}$ inches square.

Senator REED. You are perfectly clear that there is no such construction as this which you have criticized in the English and French machines that are in general use in those parts of the machines where there is the same character of strain that comes upon the De Haviland 4 at the points you have been speaking about?

Capt. SCOTT. In all the foreign machines that I have seen, as a general rule, clips were used instead of bolts. Occasionally I have

seen bolts used, but always singly, and never in great number or closely spaced.

Senator NEW. You have some other photographs illustrative of structural parts of the De Haviland 4 machine?

Capt. SCOTT. I have a photograph of the machine in which the motor broke away from the fuselage, showing the points at which it broke.

Senator NEW. Will you please submit it?

Capt. SCOTT. Yes, sir.

Senator REED. That is the one you referred to a while ago in your testimony?

Capt. SCOTT. Yes, sir. In this picture it will be noted that the longerons broke at the bolt holes, and that the veneer, which takes the place of the diagonal wires in other machines, was jointed at this weakest point of the longerons.

Senator REED. You have spoken of the defect, if it be a defect, incident to using veneer instead of wires. Is that another element of weakness?

Capt. SCOTT. It seems to be in this particular machine. There are other machines, notably those manufactured by the L. W. F. Airplane Co., in which veneer is used, but in a different and much more substantial manner.

Senator REED. Do you, then, regard it as an element of weakness that they have in these machines placed as a substitute for a wire support this veneer?

Capt. SCOTT. Decidedly so, considering their manner of attaching the veneer to the fuselage.

Senator REED. The photograph witness has been testifying about is marked "C" and is filed herewith.

Senator REED. You have handed us photograph "B" in connection with photograph "C." What is the purpose of that? Is that to show the section which broke off?

Capt. SCOTT. Yes, sir.

Senator REED. Was the whole of section C in the section which is marked "motor section weak here"?

Capt. SCOTT. The motor and the whole section broke off along the dotted lines shown in photograph marked "B."

Senator REED. In connection with this photograph I find the mark "See D. Weak fittings here." What does that indicate?

Capt. SCOTT. In order that the motor could break away the supporting cables leading to the front struts of the motor section had to give away. The fittings to which these cables are attached are quite weak.

Senator REED. The metallic fittings?

Capt. SCOTT. The metallic fittings to which these cables are attached are quite weak and gave away when the machine struck the ground.

Senator REED. You have then photograph D which is intended to illustrate these fittings that you have referred to.

Capt. SCOTT. Yes, sir.

Senator REED. You have marked one of them, "Double and strong." Does that indicate that that thing is all right?

Capt. SCOTT. That fitting is relatively unimportant, but it has been doubled and made strong.

Senator REED. Now, there is another arrow indicating a fitting which is at the point where the wires are attached to the strut.

Capt. SCOTT. To the upper portion of the strut.

Senator REED. And you have marked that "single and weak." Do you mean by that that particular metallic fitting is weak?

Capt. SCOTT. It is not sufficiently strong for the purpose for which it is intended, namely, that of largely supporting the weight of the Liberty motor.

Senator REED. Is it as strong as the one which is marked "double and strong," and which you say is relatively unimportant?

Capt. SCOTT. It is nothing like as strong and consists of a single piece of metal instead of a double piece as in the other fitting.

Senator REED. That photograph is marked "D."

Capt. SCOTT. I was told by an engineer connected with the manufacture of the D. H. 4 machine that these fittings referred to are not according to specifications, but were made by mistake, and that they are using them up, before employing other and better fittings.

Senator REED. Who told you that?

Capt. SCOTT. A Mr. Zimmerman, formerly engineer for the Curtiss Co. and recently connected with the Engle Aircraft Co., of Niles, Ohio.

Senator REED. Do you think he is there yet?

Capt. SCOTT. I saw him in Washington yesterday, and we talked over the De Haviland and its weaknesses, and I have a particularly high regard for his ability, and he agreed with me that the machine was, to express it vulgarly, rotten.

Senator REED. Do you know Mr. Zimmerman's initials, and where he is stopping?

Capt. SCOTT. He is now designing a machine on his own responsibility and can be reached through the Curtiss Engineering Co. at Hempstead, Long Island.

Senator REED. Do you know his initials?

Capt. SCOTT. I do not.

Senator REED. What hotel was he stopping at here?

Capt. SCOTT. He was here only during the day, and I asked him where he was stopping, and he said that he was not registered at a hotel.

Senator REED. Have you any better address than the one you have given us?

Capt. SCOTT. No, sir.

Senator REED. Photograph D will be introduced. Now, photograph D has on it an arrow, pointing, as I have said, to this metallic fastening and marked "single and weak. See B." Have you a photograph marked "B" to further illustrate that fact?

Capt. SCOTT. That photograph has already been introduced and shows a distance view of the parts which are shown closely in photograph "D."

Senator REED. Have you further photographs illustrating what you regard as weak points in this machine?

Capt. SCOTT. Photograph A gives a general view of the fuselage of the machine and merely shows the location of parts referred to in the other photographs.

Senator REED. These photographs, where they say, "See E," or "See B," etc., are cross references to the other photographs?

Capt. SCOTT. Yes, sir.

Senator REED. Are there other defects in this machine?

Capt. SCOTT. There are minor defects of workmanship which show to a trained eye evidences of carelessness and lack of proper inspection in the manufacture of the machines.

Senator REED. Do you care to call attention to them or are they of such a nature that you can not?

Capt. SCOTT. An example might be given in which upon stripping a machine of its fabric it was found that three alerons were made of spruce and the fourth one of ash for some unknown reason.

Senator REED. What would be the effect of that?

Capt. SCOTT. It shows merely carelessness on someone's part and probably would not affect the operation of the machine, except that it would have been much better if all four had been made of the stronger wood which is usually employed in the alerons.

Senator NEW. Captain, you have given us the names of some of the aviation officers out there at the Dayton testing field; Maj. Muhlenberg and Capt. Schroeder and Lieut. Foote. You conferred with them frequently and fully while you were making these inspections?

Capt. SCOTT. We talked over the machine day after day and these officers, especially the two latter, seemed to consider the machine not only weak, but actually dangerous.

Senator NEW. They concurred with your views as to the efficiency of the De Haviland 4.

Capt. SCOTT. Every officer at the field regularly flying the De Haviland 4 expresses the same views that I have expressed in this hearing.

Senator NEW. Captain, is it true that this is the only field at which the De Haviland 4 is tested?

Capt. SCOTT. There are a few De Haviland 4's at other fields, but this is the official testing field for these machines.

Senator REED. These officers that you say have concurred in your opinion are official testers, or flyers, or both?

Capt. SCOTT. They are flyers in the testing department.

Senator REED. Are they the officers who report on the machines?

Capt. SCOTT. They are officers who originate the reports which are submitted from that field by the chief of the testing department.

Senator NEW. Have you any reason to think that they have submitted reports to the department that are in accord with the evidence you have given this afternoon to this committee?

Capt. SCOTT. I know that they have, and while I was there a commission was sent by the War Department from Washington to report on certain features of weakness which the testing department has submitted to the War Department.

Senator NEW. Was that a commission of officers?

Capt. SCOTT. A commission of civilian experts sent there from the production department.

Senator NEW. Who comprised that commission, do you know?

Capt. SCOTT. I do not remember their names. I can get that for you.

Senator NEW. Do you know whether it made a report?

Capt. SCOTT. They undoubtedly did, because they came right back to Washington and were sent there for that purpose.

Senator NEW. You have no knowledge as to the character of that report?

Capt. SCOTT. I have not; except that they seemed to be impressed by what was shown to them.

Senator NEW. Shown by whom?

Capt. SCOTT. By the officials of the testing department.

Senator NEW. If you can, I would like you to get the names of that commission and supply them to the committee.

Capt. SCOTT. Yes, sir.

Senator NEW. Captain, I want to ask you a further question. Do you know whether any of these De Haviland 4 planes have been recently delivered to the Navy or the Marine Corps?

Capt. SCOTT. I have been told by an officer of the technical section of the Army Air Service that a large order had been placed by the Marine Corps for De Haviland 4's.

Senator NEW. You say that a large order was placed for the aviation branch of the Marine Corps. Is that what I understand?

Capt. SCOTT. Yes; the aviation branch of the Marine Corps. A few of these have been delivered, and just to-day Naval Constructor Hunsacker, who is the technical authority in the Navy is reported to me to have said that the flying officers of the Marine Corps testing these machines have sent in a protest against using them as at present constructed.

Senator NEW. As a matter of fact, then, I glean from your testimony that you regard the De Haviland 4 as in about the same class as the Bristol fighter as an unsafe machine. Is that correct?

Capt. SCOTT. Yes, sir; I consider it totally unfitted for bombing and almost equally unfitted as a combat machine.

Senator NEW. In the course of your testimony you told us of the accident out there in which Lieut. Patterson was killed. I wish you would tell the committee the purpose for which he was sent out and give a description of that accident just as briefly as you can.

Capt. SCOTT. I was told that he was ordered to go about 3 miles high and then dive vertically toward the earth for the purpose of testing a machine gun synchronizer, the gun firing through the arc of the propellor. The officers observing this flight through glasses first saw one wing leave the machine.

Senator NEW. At the height of approximately 3 miles?

Capt. SCOTT. At approximately the height of 3 miles. An instant later the other wing left the machine so that the pilot and the observer shot toward the earth on the bare fuselage, and, of course, the machine was a complete wreck upon striking. The observer leaped from the machine upon nearing the earth apparently in order to avoid being mangled. The pilot in the De Haviland sits between the Liberty motor and a 75-gallon gas tank and I am told that in no case of a serious fall has the pilot been able to escape.

Senator REED. Do you regard that as bad construction also?

Capt. SCOTT. Decidedly so.

Senator REED. Where ought the gas tank to be located in reference to the pilot?

Capt. SCOTT. In other machines, notably the Curtiss, the gas tank is in front of the pilot and also under his seat.

Senator REED. Does that interfere with his ability to see?

Capt. SCOTT. No; it does not.

(Whereupon, at 4.30 o'clock p. m., the subcommittee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

SATURDAY, JULY 27, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met at 2 o'clock p. m., pursuant to adjournment in the committee room, Capitol Building, Hon. Harry S. New presiding.

STATEMENT OF NAVAL CONSTRUCTOR J. C. HUNSAKER.

Senator NEW. Give your name and rank to the stenographer, please.

Constructor HUNSAKER. J. C. Hunsaker, naval constructor, U. S. N.

Senator NEW. Are you a graduate of the Annapolis Academy?

Constructor HUNSAKER. Yes, sir.

Senator NEW. How long have you been in the Navy?

Constructor HUNSAKER. I graduated from the Naval Academy in 1908 and from the Massachusetts Institute of Technology in 1912.

Senator NEW. How long have you had the rank of naval constructor?

Constructor HUNSAKER. I have had the rank of assistant naval constructor since 1909; of naval constructor, the past year. We lose the "assistant" after eight years.

Senator NEW. In your capacity as constructor and assistant constructor, have you anything to do specially with aircraft for the Navy?

Constructor HUNSAKER. Yes; nothing else.

Senator NEW. Your time is devoted entirely to that?

Constructor HUNSAKER. Yes; and it has been for a number of years.

Senator NEW. In this connection I would ask you what type of American-made aircraft have been delivered to the Navy for its use within the last few months?

Constructor HUNSAKER. The Navy has adopted as standard in the interests of production and in maintenance of spare parts and of supplies abroad, for any submarine patrol, two types of flying boat, a large boat equipped with two Liberty engines, and a smaller type equipped with one Liberty engine, and we have been shipping those for the past few months to France and England, where they are now in operation, and we ship nothing else.

Senator NEW. Are they giving satisfactory service?

Constructor HUNSAKER. They have not been in operation long enough on the other side to determine what changes may be advantageous. We have them operating on our own coast and they are giving satisfactory service.

Senator NEW. Where you have opportunity for trial they appeared to be giving satisfactory service?

Constructor HUNSAKER. Yes.

Senator NEW. That applies to the motor, of course, as well as to the plane?

Constructor HUNSAKER. Yes, sir.

Senator NEW. What about the De Haviland 4, so called? Have any of those machines been delivered to the Navy lately?

Constructor HUNSAKER. Yes, sir.

Senator NEW. How many?

Constructor HUNSAKER. We had an inquiry from our Marines for land machines. We do not consider that land machines are our business, and instead of going to the manufacturer we went to the then Signal Corps to buy some De Havilands for the Marines, and the necessities were urgent and they shared with us their first deliveries from the Dayton Wright factory.

Senator NEW. How many of those machines were turned over to the Marines?

Constructor HUNSAKER. There have been shipped overseas 50. There are now awaiting shipment or loading 100. We diverted four of these to the Marine training squadron in Florida to try them out and get some experience with them.

Senator NEW. At the naval testing station?

Constructor HUNSAKER. At Miami, Fla.

Senator NEW. Have the four that you delivered there been subjected to tests?

Constructor HUNSAKER. Yes; they have been flying them.

Senator NEW. Have you any reports as to the results of those tests?

Constructor HUNSAKER. There is no report as to their flying, but a great many detailed reports as to structural matters, and details of construction in the nature of instruction; minor defects that have developed from their flying.

Senator NEW. Defects, you say, which they developed from their flying?

Constructor HUNSAKER. Yes.

Senator NEW. Then they have been flown?

Constructor HUNSAKER. Oh, yes.

Senator NEW. And the defects as you say, have developed as the result of that flying?

Constructor HUNSAKER. Yes.

Senator NEW. I wish you would state just what the character of that report is.

Constructor HUNSAKER. The report has to do largely, I should say, with the quality of workmanship, and the defects, so-called, that have been found are not fundamental, and can be and will be corrected.

Senator NEW. What are those defects?

Constructor HUNSAKER. Cases of wire terminals pulling out. That was a lack of workmanship only; a matter of the soldering; cases of aileron sheaves not working freely or being properly faired up. Weaknesses in the tail structure, insufficient bracing for it, bad work in applying the fabric to the planes. It has been necessary to refit the fabric to the ribs. An improvement is required in the

method of bracing the wings against folding to the rear. A certain fitting that anchors the forward drag wires is not satisfactory. There is no use detailing such matters. There are 15 or 20 small things, any one of which is annoying to a pilot and can be corrected and will be corrected by the Bureau of Aircraft Production, and we have requested them to send experts to Florida and they have offered to supply new wings for those wings which we do not like.

Senator NEW. Then, the defects reported are such that new wings have been requested for those machines that were sent to the Florida field?

Constructor HUNSAKER. Yes.

Senator NEW. An airplane without wings is more or less useless, is it not?

Constructor HUNSAKER. It would not fly very well, sir. These planes are flying and they do fly pretty well.

Senator NEW. Are you a flyer?

Constructor HUNSAKER. No, sir; an engineer.

Senator NEW. You have never flown?

Constructor HUNSAKER. No.

Senator NEW. Still you may have an opinion as a naval constructor, anyhow, as to whether or not you would regard it safe for an aviator to take the air with a machine on which the wing fabric has not been properly stitched?

Constructor HUNSAKER. It is not safe as a general thing for an airplane to take the air with any defects in it whatsoever, but in war time a certain amount of risk is willingly taken by the flyers, but we should minimize the risk that they have to take. This can be minimized in this case by instructing the flyers to do no acrobatics with these machines until corrections have been made.

Senator NEW. Of course, we all understand that any man who goes into the military or naval service does so with the full knowledge that he must take all reasonable chances that come to a man in war, but is it not true that in the military service, as elsewhere, a man has a right to expect that every reasonable precaution will be taken to provide him with a safe appliance in which he is required to risk his life? The risk is great enough at all times without the care and attention that can be given to machines of various kinds.

Constructor HUNSAKER. Yes.

Senator NEW. You speak of a report having been made that the fabric is loosely or improperly attached to the ribs. Are there any specific details given in that report, or is that just a general statement?

Constructor HUNSAKER. It is general in that they do not say which wing or which rib. It appears to be a general condition on all the machines that the fabric is not well stitched or well stretched, and that they have had trouble from the fabric lifting away from the ribs and the stitches pulling out.

Senator NEW. When that is done does that not render the machine extremely unsafe?

Constructor HUNSAKER. Yes; and our marines have repaired that themselves. They are a pretty competent lot of fellows down there.

Senator NEW. But those machines that have been delivered have been delivered with that defect?

Constructor HUNSAKER. Yes.

Senator NEW. What knowledge have you, if any, as to the conditions in which the machines that have been sent abroad were delivered?

Constructor HUNSAKER. I have no knowledge. They have not been taken out of their crates.

Senator NEW. How many of those machines were shipped?

Constructor HUNSAKER. Fifty of them have already gone. We will make arrangements to take care of them on the other side and send new parts and alterations to be installed on them.

Senator NEW. Before they are flown?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Then, you say there are 100 crated here and ready to ship?

Constructor HUNSAKER. We have 100 ready to ship; yes, sir.

Senator NEW. What disposition is to be made of them?

Constructor HUNSAKER. That is worrying us at the present time, whether to uncrate them and make changes or to ship them and make changes on the other side, and that has not yet been decided.

Senator NEW. But before they can be used they will be examined?

Constructor HUNSAKER. They will; yes, sir.

Senator NEW. And tested?

Constructor HUNSAKER. Yes.

Senator NEW. And if found to have the same defects in the wing structure of which you have already spoken, that must be corrected before naval aviators are permitted to use them. That is correct, is it?

Constructor HUNSAKER. I doubt whether naval aviators will be refused permission to use them. They will be warned to fly them with caution. Our naval station theory is that these stations shall be largely self-supporting. They have skilled mechanics of all trades as part of the organization and they are able, if they take the time to do it, to rebuild any plane sent to them, if necessary. We have our assembly and repair base in France, which no doubt is able to make any necessary repairs of any machines we send over.

Senator NEW. But it is the business of the concern at Dayton, the Dayton Wright Co., to turn that machine over to you in good shape, is it not?

Constructor HUNSAKER. Yes, sir.

Senator NEW. The machine is supposed to be inspected before it leaves that factory, is it not?

Constructor HUNSAKER. Yes.

Senator NEW. And by whom?

Constructor HUNSAKER. By the inspectors of the Bureau of Aircraft Production.

Senator NEW. Do you regard it as a serious omission that a machine should pass inspection and be delivered to you bearing those defects?

Constructor HUNSAKER. It is poor inspection or inexperienced inspection, probably. These machines we got were the first of the output.

Senator NEW. Do you not regard that as inexcusable?

Constructor HUNSAKER. I would not say inexcusable, because I am not familiar with the exact conditions there. There may be some good excuses.

Senator NEW. I have no doubt there will be so-called good excuses. As a constructor, have you had occasion to make personal examination or consideration of the structural parts of the De Haviland 4, as made at the Dayton Wright factory?

Constructor HUNSAKER. No; I have not had any reason to believe that special examination was necessary. I made a trip to Dayton and went through the factory last month while these machines were coming along, and since have received from the Bureau of Aircraft Production engineering data which indicate that the structural design affords an ample factor of safety.

Senator NEW. You, of course, know what the longerons of a machine are?

Constructor HUNSAKER. Yes, sir.

Senator NEW. It has been reported to this committee that the longerons of the D H. 4, as made at the Dayton Wright factory, are of spruce, whereas other and stronger woods are used in the same construction in the original machine as made in England. Do you know anything as to the accuracy of that statement?

Constructor HUNSAKER. No; I would not know. I am not familiar with these military machines in detail, but I would consider it no defect to make longerons of spruce rather than ash if they were of proper size. We use it.

Senator NEW. They are 1½ inches square, I believe. It has also been reported to this committee that within a space of 10 inches there are nine quarter-inch bolts set through these longerons. Would you regard that as structurally weakening the machine, to do that?

Senator NEW. Nine quarter-inch bolts through a piece of spruce timber 1½ inches square within a longitudinal space of 10 inches?

Constructor HUNSAKER. It sounds ridiculous. I do not know where that would be done.

Senator NEW. There is a photograph of it and I call your attention to that photograph.

Constructor HUNSAKER. Is that meant to be a splice?

Senator NEW. No.

Constructor HUNSAKER. That is a butt joint. The longeron is in two parts. It comes here in the middle of the fuselage and these fish plates of steel run, one on the bottom of it and one on the top. There are three bolts to the right of the joint and three to the left, so that this may be taken down and the fuselage will come apart. That seems to be a quick demountable fitting perhaps to facilitate shipment. The longeron there is strengthened by these steel planes top and bottom.

Senator REED. Of course, to strengthen the splice it is necessary to have plates above and below in order to make a splice at all, if it is a splice.

Constructor HUNSAKER. Yes.

Senator REED. What would be the occasion for a splice there?

Constructor HUNSAKER. In order to take the after part of the fuselage off so it will be shipped in a smaller package. I recall having seen one of those in Dayton, so that the fuselage can be broken into two parts for shipment.

Senator NEW. I show you photograph "A" and call your attention to this point where the arrow strikes the fuselage and the legend "See E" is opposite the end of it. Is that the point on the machine at

which the bolts are shown in the photograph marked "E" which you have just seen?

Constructor HUNSAKER. I should presume so. That is the logical place to put the joint.

Senator NEW. I call your attention to a photograph marked "C." There appears here a section of the longeron of the machine with bolts marked as penetrating that.

Constructor HUNSAKER. Is this taken at the same section as photographs A and E?

Senator NEW. I presume so.

Constructor HUNSAKER. This is after some wreck?

Senator NEW. That is on a wrecked machine, yes. Do you see anything in that that indicates a structural weakness on that machine?

Constructor HUNSAKER. It appears to be broken, but we do not know the conditions under which it was wrecked. If that blade had been stronger, it would, no doubt, have broken in another place. The matter of the design of a take-down fuselage is a technical matter. You might use bolts and make up for the bolt holes by the use of steel straps. It seems to be within any ordinary engineer's province to make a joint which will not weaken the general structure of the fuselage. I can not tell by looking at these fuselages whether that joint is a good one or not. There is nothing unreasonable about it, however.

Senator NEW. Airplanes are like other machines; they are likely to break at the weakest point.

Constructor HUNSAKER. Yes, sir.

Senator NEW. Who are the officers who have made these reports, officers or cadets, or whoever they were?

Constructor HUNSAKER. The commanding officer of the first marine aviation force, Miami, Fla.

Senator NEW. Is his name given?

Constructor HUNSAKER. We have them from Capt. Walter E. McCaughtry, captain in the United States Marine Corps, who is commanding officer at Miami.

Senator NEW. From the reports that you have seen and your own experience with the De Haviland 4, I ask you directly if you regard it in its present condition as a safe airplane?

Constructor HUNSAKER. I do not know what its present condition is. Of course, the Bureau of Aircraft Production is fully informed as to the troubles that have been had to date, and they are doing everything possible to correct them. In its condition as first delivered to us I can answer the question by saying that it was not safe, but there is nothing about the difficulties found that can not be corrected, and the machines can be made safe.

Senator NEW. Did you have any experience with the Bristol machine?

Constructor HUNSAKER. No, sir; I went to Buffalo and looked at one once.

Senator NEW. What was your impression of the Bristol?

Constructor HUNSAKER. I had been told that it was overpowered and structurally weak, and it looked it.

Senator NEW. You know that a board of Army officers did make an adverse report upon it, and that pursuant to that report it was condemned?

Constructor HUNSAKER. Yes.

Senator NEW. Do you know whether the changes recommended by the Navy Department have been made in the De Haviland 4 or is it still being turned out like the four on which this report is based?

Constructor HUNSAKER. I have no knowledge based on my own inspection, but I have been assured that all changes are being taken care of at the present time.

Senator NEW. Whence comes that assurance?

Constructor HUNSAKER. From a conference between Naval Constructor Ream, in our office, and officers attached to Mr. Potter. I do not know with whom Mr. Ream had his conference, but he has made several trips to the bureau to press the matter of disposing of these planes that we now have on our hands, and he reports that he reached a satisfactory agreement with them.

Senator NEW. As I understand you, then, it is true that the 150 De Haviland 4 planes which have either been shipped or delivered for shipment must be gone over and these reported defects remedied before you regard them as safe and efficient machines?

Constructor HUNSAKER. Yes, sir.

Senator NEW. And this will be done before they are released for use?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Have you any idea how much time that will require?

Constructor HUNSAKER. No; I have not. We are working on that now.

Senator NEW. You do not know whether that will be done on this or the other side of the water?

Constructor HUNSAKER. No decision has been reached yet.

Senator NEW. I guess that is all.

(Whereupon, at 3 o'clock p. m., the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

TUESDAY, JULY 30, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2 o'clock p. m. pursuant to adjournment in the committee room, Capitol Building, Hon. Harry S. New presiding.
Present: Senators New and Reed.

STATEMENT OF MAJ. H. C. K. MUHLENBERG.

Senator NEW. Maj. Muhlenberg, you are now stationed at Dayton?

Maj. MUHLENBERG. At the Wilbur Wright Field; yes, sir.

Senator NEW. At the Wilbur Wright Field?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. In what capacity?

Maj. MUHLENBERG. Commanding officer, testing department.

Senator NEW. How long have you been there?

Maj. MUHLENBERG. I have been there since about the 12th of May—May 10 or 12.

Senator NEW. How long have you been in the United States Army, Maj. Muhlenberg?

Maj. MUHLENBERG. I entered West Point in 1904, graduating in 1908.

Senator NEW. You are a graduate of the Military Academy?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Are you an engineer?

Maj. MUHLENBERG. No, sir.

Senator NEW. You are not an engineer?

Maj. MUHLENBERG. No. I was assigned to the Infantry and served in the Infantry three years, and then four years in the Ordnance Department, then two years in the Infantry, and then I was assigned to the Signal Corps in October of last year.

Senator NEW. What machine is undergoing inspection and observation at your field?

Maj. MUHLENBERG. We have completed the standard performance test of the De Haviland 4 and are now working on the standard performance test of the Standard M. Defense single seater and the English-built Bristol fighter with the 300-horsepower Hispano-Suiza motor in it.

Senator NEW. It is with special reference to the De Haviland 4 that I wish to examine you at this time. What is the De Haviland 4 machine?

Maj. MUHLENBERG. It is a two-seater machine for three purposes: A day bomber, a fighter, and a reconnoissance machine, showing a different load for each of these three duties.

Senator NEW. Originally it was an English machine, was it not?

Maj. MUHLENBERG. It was an English machine originally; yes, sir.

Senator NEW. What changes, if any, have been made in that machine by the Americans, as compared with the English model?

Maj. MUHLENBERG. I have a report on the English De Haviland here. While I have not gone into it at length, it appears to be very much the same machine that we had. There seem to be some changes, of course, to adapt it to the Liberty motor. The motor there, I believe, is the Rolls Royce. There have necessarily been some changes to adapt it to the Liberty motor, but otherwise, in general the appearance is exactly the same.

Senator NEW. In making these changes, has it been necessary to add much, comparatively speaking, to the weight of the machine?

Maj. MUHLENBERG. The weight given here for the English is 1,630 kilograms, and the weight of the American De Haviland is given as 3,700 pounds. I can not now translate that English weight into pounds. The results are given in French, in kilograms. I have the results here in pounds. I can translate them subsequently, but I have no means at the present time of doing that.

Senator NEW. I wish you would make that translation and supply it when this evidence is sent to you for revision.

Maj. MUHLENBERG. Yes, sir; I will do that; 2.1 pounds equal 1 kilogram.

Senator NEW. Major, a great deal has been said lately about the character and qualities of the De Haviland 4 machine. I want to ask you some pretty direct questions concerning it. Are you satisfied from your observations with the present condition of the De Haviland 4 machine?

Maj. MUHLENBERG. No, sir. It is by no means the machine we want for a fighter nor the machine we want for a bomber. As a reconnoissance machine, and, possibly, as an artillery observation machine, it would be all right, but certainly not as a fighter nor as a bombing machine. It will not fill the bill of either one. Of course it is the only plane that approaches a fighter plane now in full production, and necessarily I would not advocate stopping its production at all, but the minute a better fighter can be produced, or a better bomber can be produced, that plane should take the place of the De Haviland for those purposes.

Senator NEW. Then, what are its defects as a bomber?

Maj. MUHLENBERG. As a bomber, it has a ceiling of 15,800 feet. That is the maximum ceiling. The service ceiling is very close to 15,000 feet. That means the ciling at which the rate of climb is less than 100 feet per minute. That is about 15,000 feet. Now, as a day bomber, the ceiling should be better than 15,000 feet. It should be considerably better than that, because hits have been known to have been made by antiaircraft batteries at 15,000 feet altitude. The best ceiling, as I say, of the De Haviland 4 is 15,800 feet. In addition to that, the De Haviland carries at the present time 75 gallons of gasoline. Its consumption, at full throttle, is 37 gallons per hour, so it carries about two hours' fuel at full throttle, which is a

very limited capacity for a bomber, unless that bomber is to be employed immediately around the airdrome from whence it comes.

In addition to that, in the trials which were recently made at the Wilbur-Wright field, in dropping bombs, there was considerable difficulty experienced in maintaining communication. The proper kind of communication between the pilot and the observer was difficult. The pilot is so far from the observer that they have to communicate by interphone, and that is not the best means of communication. The best means of communication would be by touch, where the pilot would be immediately in front of the observer, and the observer could point him in the right direction, so as to enable him to drop his bombs.

Another thing is this: The pilot is so situated in between the wings that he can not see the object at the proper time, just before the observer picks it up. The pilot should first pick it up, and he should follow it until the observer can pick it up, and the observer should pick it up far enough in advance to set the bomb right at the proper time. As the target comes under the leading edge of the lower wing, the pilot loses sight of it and the observer does not pick it up until it is too late to set the sight from the end seat.

Senator NEW. Isn't that a very serious defect in a day bomber?

Maj. MUHLENBERG. A very serious defect, yes, sir. We overcame it to some extent by putting a negative lens immediately in the rear of the pilot's right foot, so that he could see something, but that was only an expedient, and I believe it panned out fairly well.

Senator NEW. In other words, the vision of the pilot is so interfered with by the structure of the machine that it impairs its efficiency as a day bomber?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Is there any other defect that detracts from its efficiency as a bomber?

Maj. MUHLENBERG. Structural defects only that show that it is not constructed strongly enough for the load that it carries. It may be built to carry it without accident, but there are certain structural defects in it that should be remedied, even for use as a fighter, and more so for use as a bomber, where it carries that heavy load.

Senator NEW. You spoke of structural defects there that impair its strength. Do I understand you to mean that you think the machine is not strongly enough built?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. To answer the purpose for which it is designed to be used by our forces?

Maj. MUHLENBERG. There are three or four points in which it is not strong enough.

Senator NEW. What are those points—the structural points?

Maj. MUHLENBERG. I have a photograph here showing the nose of the machine without the motor. You can see it here. [Indicating on photograph.]

Senator NEW. You have handed me a card bearing two photographs, numbered 521 and 522.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Please tell us just what these photographs represent.

Maj. MUHLENBERG. The photograph numbered 522 is a picture of the nose of the De Haviland 4 with the motor out. I wish to draw your attention here to the two nose drift wires. These two wires

[indicating] both run to the same fitting, this fitting here [indicating], and that fitting is held in place by a tie-rod, which runs through the lower longeron and through the fuselage to the longeron on the other or opposite side of the machine. You can not see it in the picture, but on the other side of the fuselage is a corresponding fitting, and to that the two nose drift wires run.

Now, going back to these nose drift wires, these two wires run to the top and bottom, respectively, of the first strut, and are the only effective means of preventing the wings sweeping back in a dive.

Senator NEW. Can you identify these wires of which you speak on the photograph which I will now hand you and which is marked "B"?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. That is a photograph which was made a part of the evidence given by Mr. Riley Scott, formerly of the Army, who testified before this committee as a witness a few days ago. I will ask you if you can identify these wires so as to make these photographs correspond?

Maj. MUHLENBERG. The wires spoken of are those which run from the top and bottom of the first strut out from the fuselage.

Senator NEW. As shown on photograph "B"?

Maj. MUHLENBERG. As shown on photograph "B"; yes, sir. They run to the fitting at the lower portion of the nose near the radiator. These are the only wires, as I said, that effectively prevent the wings from sweeping back in a dive. We had just such an accident at the Wilbur Wright field on the 19th day of June.

Senator NEW. Was that the accident in which Lieut. Patterson was killed?

Maj. MUHLENBERG. Yes, sir. As far as we could tell from the examination of the wreckage, that tie rod, which ties in the two fittings spoken of on either side of the fuselage, sheared off, or pulled out, due to the pressure exerted on the wings in the dive, allowing the wings to sweep back and leave the fuselage. I have pictures of the wreck.

Senator NEW. I infer from that that this accident was probably due to a structural weakness of this machine?

Maj. MUHLENBERG. Yes, sir. That is my opinion. That opinion has been expressed in a report rendered by my office to the Director of Military Aeronautics.

Senator NEW. Will you please tell me the date of that report?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Have you a copy of it?

Maj. MUHLENBERG. I have only the photograph, but not the report itself.

Senator NEW. Can you give us the date of that report?

Maj. MUHLENBERG. I find that I have it here after all. It was dated June 26. [Handing report to Senator New.]

Senator NEW. Will you state what the gist or the substance of this report is?

Maj. MUHLENBERG. The gist of the report was that this tie rod spoken of failed, allowing the nose drift wires to become loose, which allowed the wings to sweep back. Of course, the plane being at 15,000 feet altitude, it was impossible for anyone to tell exactly what did occur, but the examination of those fittings and that rod leads

to the conclusion that was reached by my office. There has been nothing to even reasonably disprove that theory. In a sand test the De Haviland has failed at that point.

Senator NEW. Just what do you call a sand test?

Maj. MUHLENBERG. It is a static load test, where the machine is turned upside down and the sand is placed on the wings until they fail. The wings are at an angle of 14 degrees from the horizontal, so as to bring the strain on the drift wires as well as on the——

Senator NEW. The machine is called upon to stand a test equivalent to that which it would have to stand from air pressure in the air?

Maj. MUHLENBERG. Yes, sir. The De Haviland failed at that point, as I remember it, in two sand tests made at the McCook field, at a factor of failure of from $4\frac{1}{2}$ to 5 or 6, which means that the wing was loaded with approximately six times the maximum load that the ship would be expected to carry before breaking. The French consider that the proper factor of safety is seven.

Senator NEW. Do you know what the English regard as the proper factor of safety?

Maj. MUHLENBERG. I do not know; no, sir.

Senator NEW. If there are other structural defects which you have in mind, will you state what they are? I wish to ask you at this point to supply copies of any photographs to which you testified before this committee, because without them your testimony will not mean much.

Maj. MUHLENBERG. Yes, sir; I will do that.

Photograph No. 524 shows a part of the wreck of June 19.

Senator NEW. Which, for the purpose of identification, we will call the Patterson machine.

Maj. MUHLENBERG. Yes, sir.

This fitting shown is the fitting which joins one of the main wing spars to the fuselage, or to the center section. That fitting is shown with a single bolt through it. We believe that that fitting should be stronger, and should have two bolts through it instead of one; also that the end of the spar should be capped with a metal fitting, so as to tie the wing bolt to the spar by something other than the small piece of wood contained in the end of the spar. The hole for the bolt is simply driven through the end of the spar. There is little or nothing but that piece of wood in the end to hold that bolt to the wing spar. Now, either a fitting should go around that spar, a metal sleeve, so to speak, or the internal drift wires shown at this point should be tied to the bolt, so that the bolt can not separate from the wing.

Senator NEW. You are now indicating a point marked "A B" on the margin?

Maj. MUHLENBERG. Yes, sir. I have another photograph, showing how the ends of the spars were simply pulled out.

Senator NEW. That is photograph No. 525?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. They appear to have been pulled right out?

Maj. MUHLENBERG. Yes, sir. Of course, it might have been the failure of those wing spars that caused the accident, but that is hardly probable, because they would give as soon as the nose drift wires gave. The failure of the nose drift wires would necessarily

cause the main spars to give, as shown in the photograph, because the wings were swept absolutely clean from the fuselage.

Photograph 519 is a picture of one of the fittings of the Patterson machine fastening the nose drift wires to the fuselage and shows the fittings, wires, and turnbuckles in good condition, showing that the rod, the tie-rod connecting one fitting to the other through the fuselage, was the thing that failed. These fittings stayed with the wings and the tie-rod went with the fuselage, which landed about 1,000 to 1,500 yards away from the wings, so that the tie-rod must have been sheared or pulled apart in the air.

Senator New. You may proceed, Major, if there are other structural defects which occur to your mind.

Maj. MUHLENBERG. The principal structural defect over and above those I have mentioned is the fabric which covers the wings. The fabric over the entire wing in nearly all De Havilands is much looser than the fabric in our training planes. By tapping it with the fingers you get a different sound from that which you get when you try this on the training planes.

Senator New. Should that be the case?

Maj. MUHLENBERG. It is believed by everyone to whom I have spoken on the ground that the fabric should be tight.

Senator New. Is the fact that it is looser on the De Haviland than it is on the training planes due to design or is it the result of bad workmanship, or to what is that to be attributed?

Maj. MUHLENBERG. It may be any one of four or five different things. It may be caused by the dope; it may be caused by the paint; it may be caused by lack of initial tension in putting on the fabric; it may be due to a combination of all these. The chances are it is due to a lack of initial tension in putting the cloth over the wing. Acetate dope is now used for doping battle planes, whereas nitrate dope is used in training planes.

Senator New. But whatever the cause of the weakness, it is a structural defect which should not be there; is that the case?

Maj. MUHLENBERG. Yes, sir. It should be tight, just as tight on the battle plane as it is on the training plane.

In addition to this looseness all over, we have what is believed to be a new problem in aviation that of keeping the wing fabric attached to the ribs of the wing, in the slip stream. That is where the wind strikes the ship in the rear of the propeller. In all high-powered Liberty motor planes that we have had we have had trouble with that very thing. The vibration from the propeller in the slip stream sends ripples down the cloth that tear it loose from the ribs in time, and that problem has not been properly appreciated up to the present time because it was brand new. I doubt if it has been met in Europe at all.

Senator New. By reason of the fact that the high-powered Liberty motor is not in use?

Maj. MUHLENBERG. Yes, sir. That is the fact.

Senator New. Is that your conclusion?

Maj. MUHLENBERG. Yes, sir. The Navy, I understand, is having the same trouble.

Senator New. With its boats?

Maj. MUHLENBERG. Yes, sir. The difficulty of keeping the fabric attached to the ribs is what I refer to.

Senator NEW. I asked you if they are experiencing that trouble with the boats for the reason that I know of a report which was made last week of a trial and inspection by the Navy Department of De Haviland 4 machines which had been submitted to it for test, and I wondered if you had reference to that particular report?

Maj. MUHLENBERG. No, sir. My knowledge of what troubles the Navy has had is only hearsay. I have heard that they are having the same trouble with their Liberty motor planes as we are. They attribute it to a little different cause, but naturally we think we are right. We think it is caused by the vibration of the motor or of the propeller in the slip stream.

Senator NEW. That is your theory?

Maj. MUHLENBERG. That is my theory and the theory of the office.

Senator NEW. It is the theory of the officers in charge of the test field at Dayton, Ohio?

Maj. MUHLENBERG. Yes, sir. The increased number of ribs and the improved methods of sewing on material to the ribs and tighter fabric on the wings will probably eliminate this. If it does not—and we are going to find out by experiments at the Wilbur Wright field—experiments will have to be made with a stronger and coarser cloth, or with veneer. We are trying veneer, also, in our experiments. That is not a structural defect peculiar to the De Haviland. We have seen it on the LePere machine and on the Bristol. I believe it was that trouble that caused the death of Philip Rader at Buffalo, especially as the upper wing of that American-built Bristol is much more in the slip stream than is the upper wing of the De Haviland. The gap, that is, the distance between the upper and lower wings on the De Haviland, is greater than that on the Bristol. Both wings are lower on the Bristol than on the De Haviland, so it brings the upper wing more in the slip stream than is the case with the De Haviland, so that you get a condition of affairs in the Bristol that you do not get in the De Haviland. That is why, in the Bristol, the upper surface of the upper wing comes loose, just as I have described. In the De Haviland we have only the under surface of the upper wing and both surfaces of the lower wing come loose from the ribs.

Senator NEW. The committee has heard some evidence to the effect that the tail of the De Haviland 4 is weak.

Maj. MUHLENBERG. The stabilizer is certainly not fastened to the machine in the strongest manner possible. It looks frail and feels frail in the air. We have not had an accident to date from that cause that we know of, but we received a communication from the Director of Military Aeronautics shortly after the Patterson accident suggesting that that might possibly have been the cause of that accident, because such accidents—that is, the failure of the stabilizer—had happened in England; but we could not find anything to substantiate the assumption that the stabilizer failed in that accident. However, that stabilizer is not fastened to the machine as strongly as the stabilizer of the Le Pere machine is fastened. A man can jump on the stabilizer of the Le Pere machine without apparent injury to the machine, whereas if he were to do that on the De Haviland he would probably injure it. It looks to frail for that.

Senator NEW. I would like to ask you, Major, to point out what, in your opinion, should be done to remedy the defect shown in the photograph numbered 522.

Maj. MUHLENBERG. The two nose drift wires, instead of running to one fitting, should run to two different fittings on each side of the fuselage. The upper fitting should be located, preferably, on the engine bed, or at the forward end of the upper longeron, and each pair of the fittings should be tied in by an alloy steel rod.

Senator NEW. Now, I would like to call your attention to a photograph marked "E," which was submitted by Capt. Scott, a recent witness before this committee. I call your attention to the fact that in this photograph it is shown that a number of quarter-inch bolts are run through the longeron of the machine. In your opinion, should that construction be followed there?

Maj. MUHLENBERG. No, sir. I believe that it is possible to get the same or greater strength without so many holes in the longeron.

Senator NEW. In your judgment, does the presence of those bolts and the necessary holes through the longeron to receive the bolts weaken the structure?

Maj. MUHLENBERG. Yes, sir; I believe so.

Senator REED. Is that a dangerous weakness?

Maj. MUHLENBERG. I would not call it highly dangerous. We have known of the existence of those bolts, as you say, at the field. Our pilots are in the habit of making fast landings, to avoid putting a strain on the fuselage at that point. By a fast landing, I mean putting the landing wheels on the ground in landing, with the tail high.

Senator REED. In other words, these men must regard it as a place likely to be broken, or they would not be landing in this way to protect it?

Maj. MUHLENBERG. Exactly, yes, sir. It has failed at that point in the sand tests.

Senator REED. It has also failed at that point in a number of accidents; that is, you have found the longerons broken at that point?

Maj. MUHLENBERG. We have only had one accident with the DH4 at the Wilber Wright Field. Of course, that machine failed everywhere after it struck.

Senator REED. You said that it "failed everywhere." You mean by that that it struck so hard and smashed into so many small pieces that you could not tell where the original break was?

Maj. MUHLENBERG. Yes. We could not tell definitely; no, sir.

Senator REED. But in the sand test the De Haviland 4 has broken. The longeron has broken noticeably at the point where the longeron is pierced by these bolts, as is shown in these photographs?

Maj. MUHLENBERG. I believe so. That statement can be verified by reference to the record of sand tests at McCook Field, but I believe it has failed there. I know that in a sand test which I witnessed on the fuselage of the De Haviland, they expected it to break at that splice.

Senator REED. If, instead of boring these nine holes through the longeron and then putting these bolts through, a steel clasp was put around the fuselage, that would do the same work as the bolts, would it not? You could employ that in lieu of a bolt, could you not?

Maj. MUHLENBERG. Probably. I would like to experiment with it before taking the ship into the air if it was treated in that way.

Senator REED. You know, as a mechanical proposition, that a steel clasp can be put around it?

Maj. MUHLENBERG. Yes, sir. At all events, those bolts could be so spaced that they would not weaken the longeron as they do.

Senator REED. You mean as much as they do?

Maj. MUHLENBERG. Yes, sir; as much as they do.

Senator REED. What do you say about the supports of the engine? Is not the engine support itself weak in this machine?

Maj. MUHLENBERG. Well, from one accident which we had, or rather, one forced landing, it would appear that the engine support is not what it should be in that photograph of the fuselage (indicating), which is marked "C." In that accident, or forced landing, which was made by Maj. Ocker, at Bridgewater, Va., due to a leak in the gasoline tank, which was a landing in bad terrain, he smashed everything on the machine below the lower longerons, and also the lower longerons. In addition to that, the engine bed sagged, as shown in the photograph. I can hardly see, though, that that proves that that particular portion is any weaker than the rest of the fuselage. In order to get lightness and corresponding of performance in the air, a battle plane fuselage can not be made to resist a possible forced landing the way a training plane can be made to resist it. It must be weaker in order to make it light. If we had the De Haviland fuselage as strong as the JN-4 fuselage, correspondingly, it would be too heavy to manipulate in the air. So, while that failure occurred in that particular landing, I would hate to say that it shows any great structural weakness in the machine, because it was a bad landing—it was a good landing in a bad territory—and we all know that a bad landing in that plane is liable to result in serious injury to the pilot, and possibly to the observer, because so much depends on the veneer that is on the fuselage. It is not braced with wood and wire the way the training plane is braced.

Senator REED. Why isn't it braced with wood and wire?

Maj. MUHLENBERG. Because to do that would make it heavy.

Senator REED. How much would it really add?

Maj. MUHLENBERG. A few pounds, not a great many, but the cry is all through, "cut out the weight."

Senator REED. And have we not cut it out in this country in our construction until to-day we have got our machines very dangerous? Have we not cut more, I will add, than any other country, in that respect?

Maj. MUHLENBERG. Really, I am not familiar enough with foreign planes to say.

Senator REED. Very well. The load of the machine has a great deal to do with the wing pressure, does it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Do you know the weight of the engine that the English De Haviland carries, the plane from which this was copied?

Maj. MUHLENBERG. About 600 pounds, I think. It is six or seven hundred pounds.

Senator NEW. If you have any figures, let me have them. I think you are away up.

Maj. MUHLENBERG. This will give it in kilograms. It does not give the weight of the engine. It gives the weight of the machine.

Senator REED. Do you know of any engine that was used in the De Haviland 4 in Europe that had the equivalent in horsepower of the Liberty motor?

Maj. MUHLENBERG. The nearest thing was the Rolles Royce, a 375-horsepower motor.

Senator REED. The others were considerably below that?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Now, the horsepower of the engine and the weight of the engine and the weight of the load driven by great horsepower vastly increases the pressure upon the wings?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And upon the whole machine?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Could this Liberty motor be cut down to an eight-cylinder machine, let us say, and yet be powerful enough to handle that De Haviland?

Maj. MUHLENBERG. I have heard it said that the English De Haviland handled better with a lower powered English motor than with the Liberty motor. I have heard that said by an Englishman. I have never flown it myself, of course, so that I can not say it at first hand. We are trying now the English-built Bristol fighter to act as a fighter, and that plane is equipped with a 300-horsepower Hispano-Suiza. The chances are that that machine will give a better performance as a fighter, or at least as good a performance, as the De Haviland; that is, with the 300-horsepower motor instead of the Liberty. That is largely because the ship is lighter.

Senator REED. That is to say, the experiments thus far seem to indicate, without being conclusive, that if you were to put a 300-horsepower Hispano-Suiza into this Bristol machine which we have been building in this country, and which we understand has been practically discarded, that that might perform a better service?

Maj. MUHLENBERG. I am talking about the English-built Bristol machine.

Senator REED. So that you would not want to say that about the American-built Bristol machine?

Maj. MUHLENBERG. No, sir.

Senator NEW. You have just spoken of the Bristol and have said that you are experimenting with the English plane of that name at the Wilbur Wright field?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. In what respect does that plane differ from the so-called Bristol, which we have been making in this country at the Curtiss factory, and which has recently been discarded?

Maj. MUHLENBERG. It differs principally in weight. I do not know what the weight of the American Bristol is, but the weight of English-built Bristol, loaded as a fighter, is 2,910 pounds, full fuel and oil, just 900 pounds less than the weight of the De Haviland loaded as a fighter. That plane gives promise of being a very satisfactory fighter. So far we have been compelled to experiment with an old motor and an old plane, but when we get the new motor and the new plane, as we will do before very long, the performance will undoubtedly show a great improvement.

Senator NEW. You approve of the rejection, do you, of the American-built Bristol machine?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. You do not think it should be used?

Maj. MUHLENBERG. No, sir.

Senator NEW. You do not think it is a fit machine as made in this country?

Maj. MUHLENBERG. No, sir.

Senator REED. I believe you gave some testimony somewhat along that line long before this plane was condemned, did you not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. To this committee?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Will you state, briefly, what, in your judgment, were the material defects in the American Bristol?

Maj. MUHLENBERG. The ribs are too far apart in the wings. In some cases, the spars were misplaced. The upper spars were where the lower spars should have been, or vice versa. The internal drift wires in the wings were not properly arranged. The flying wires were where the landing wires should have been, and vice versa; and it looks very much as though the covering for the wings in the center section, in the slips stream, should have been made of radically different material. Those wings get a much greater whip from the slip stream by their location than even the wings of the De Haviland do, especially the upper wings, and the chances are that material should be of heavy, coarse linen, or veneer.

In addition to that, the overhang of the motor bed is all right for a lighter motor, but for the heavy Liberty motor it is of faulty construction. It is what is known as cantilever construction. The motor hangs out in the front with a very poor support. The weight is not carried properly back to the fusilage or to the landing gear for that heavy motor.

Senator REED. In other words, you think it is a botched affair?

Maj. MUHLENBERG. I have seen samples of that kind.

Senator REED. Doesn't that indicate the grossest kind of carelessness in the assembling of the machine?

Maj. MUHLENBERG. It looks that way.

Senator REED. Isn't that inexcusable in a shop that pretends to turn out machines of this character?

Maj. MUHLENBERG. Yes, sir.

Senator REED. That would be inexcusable in a wagon maker, would it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Where did these machines come from that were built in this way?

Maj. MUHLENBERG. They were built at the Curtiss plant.

Senator REED. Were those defects that you have spoken of largely visible to the eye or were they hidden?

Maj. MUHLENBERG. Oh, you would have to take off the wing covering to find them.

Senator REED. So that the poor fellow who had to go up in the machine went up without knowledge of the character of construction?

Maj. MUHLENBERG. Yes, sir.

Senator REED. In other words it was covered up?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And a proper inspection of the machine as it was being built would have discovered all those defects, would it not?

Maj. MUHLENBERG. Not all I have mentioned; but those wing defects, internal wing defects, should have been discovered on inspection.

Senator REED. What ones would not have been discovered on inspection?

Maj. MUHLENBERG. Well, the improper spacing of the ribs could be seen by anyone by casually looking at the machine, provided he knew the problem that he was up against.

Senator REED. That, then, was another defect that could have been observed upon proper inspection?

Maj. MUHLENBERG. If the inspector had had the proper knowledge of the problem.

Senator REED. Exactly. Well, proper inspection, of course, implies a proper knowledge, does it not?

Maj. MUHLENBERG. Yes, sir; but what I want to point out is that the question of keeping the fabric on the ribs seems to be a problem new to everybody in aviation.

Senator REED. That is to say, this is the first time that we have put a motor into a machine, the motor being so powerful as to tear the machine to pieces?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And this is the first time anybody has built a motor and put it into a machine without experimenting to find out whether the machine was strong enough to stand it, so far as you know?

Maj. MUHLENBERG. That is a pretty general question.

Senator REED. You need not answer that question. It is hardly a proper one.

Maj. MUHLENBERG. I do not know.

Senator REED. As a matter of fact, the history of aviation is that the great trouble they had in the early days of aviation was to get a motor strong enough to drive the machine?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And, accordingly, the machine generally was strong enough to stand any motor that they put into it?

Maj. MUHLENBERG. Yes, sir.

Senator REED. But now we have produced a motor of about 525 horsepower in the Liberty motor?

Maj. MUHLENBERG. Approximately 400.

Senator REED. Four hundred to four hundred and twenty-five horsepower?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And that has been put into these machines that have not been theretofore tried with either so heavy or so powerful a motor?

Maj. MUHLENBERG. That is the point.

Senator REED. And when you put that to the test the covering of the wings began to give away?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And those other defects of construction that you have been speaking of were defects as a result of not properly following

the design, or defects that resulted from not doing the work according to the design?

Maj. MUHLENBERG. All except the engine bed overhand. That was a defect in design.

Senator REED. Of course, you have not torn open all the Bristols that have been manufactured?

Maj. MUHLENBERG. No.

Senator REED. A very small percentage?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Now, in what percentage of those that you did have opportunity to go through and examine, inside and outside, did you find those defects that you have spoken of?

Maj. MUHLENBERG. We have not tested the Bristol at all in my department. We have simply seen and had our attention called to samples of the work which was improperly done in ships that were owned by the production engineer department. It is a very small number and not to be expressed in percentages. We know these faults do exist. We know that these drift wires are improperly placed, that the spars are improperly placed, and that the ribs are too far apart.

Senator REED. Are you familiar with the way the inspection is done at the Curtiss plant?

Maj. MUHLENBERG. I know approximately what is done at the Dayton-Wright plant.

Senator REED. There are two sets of inspectors, one set for the factory and one set for the Government?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And as the work progresses, these men have opportunity to see each step that is taken in the machine from the time it is laid out until it is completed? They have every opportunity to see; they have a chance to see the machine, inside and out, do they not, before it is covered up?

Maj. MUHLENBERG. Before it is covered up; yes, sir.

Senator REED. There is a factory inspector and a Government inspector, both of whom have that opportunity; that is right, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Yet you found these machines in that shape with that double inspection upon them?

Maj. MUHLENBERG. Yes, sir.

Senator REED. That either indicates the grossest kind of carelessness or else it indicates conspiracy?

Maj. MUHLENBERG. One or the other.

Senator NEW. Maj. Muhlenberg, you spoke some time ago of the gasoline supply carried by the De Haviland 4 as being insufficient for its use as a day bomber.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Seventy-five gallons, I think it was, you said it carried?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Which would give it approximately two hours' radius?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. How much gasoline should a day bomber carry; that is, what radius should be afforded to a day bombing machine to make it acceptable for that purpose?

Maj. MUHLENBERG. As I understand it, in Europe the aerodromes are, speaking aeronautical distances, fairly close to the lines, and if a ship were not to go too high before going over the lines, an hour's fuel out and an hour's fuel back, would probably be sufficient for day bombing, but it takes the De Haviland 48 minutes, approximately, to get to its ceiling. Its ceiling as a bomber is 15,800 feet. It ought to get to that ceiling before it goes to the lines to function as a day bomber. Therefore, there is over three-quarters of an hour's fuel that is gone before it can function at a proper altitude. It then has an hour and 13 or 14 minutes of fuel left. That is at full throttle. It has, in fact, an hour and about 12 minutes to go and come.

Senator NEW. About an hour and 12 minutes?

Maj. MUHLENBERG. Yes, sir. You would consume 48 minutes' worth of gasoline in getting your altitude before the day's work could be started at all. That would leave only about an hour and 10 or 12 minutes, approximately, of gasoline to do the work with.

Senator REED. Is this not true, also, that in seeking this altitude, or achieving this altitude, air currents and air conditions generally might compel you to use a great deal more gas to get up on some occasions than on others?

Maj. MUHLENBERG. No, sir; that would not make any great difference. No; I do not think it would make any particular difference.

Senator REED. Suppose you were required to go up with an adverse wind blowing. I mean to say that you might desire to go east when there was a wind from the east blowing at the rate of 45 miles an hour. You have to hold yourself against the wind and at the same time you are making your climb.

Maj. MUHLENBERG. That would not make any difference on a time climb to a given altitude. You might stand still over the same spot on the earth. If the speed of the ship was 120 miles an hour and the wind was blowing at the rate of 120 miles an hour, you might stand still, as far as the earth was concerned, but you would get altitude just the same. It would not make any difference in the time as far as getting the altitude is concerned.

Senator NEW. You have spoken of some of the defects which, in some measure, disqualify the De Haviland 4 as a bombing plane. Do you know of any defects which tend to disqualify it as a fighter?

Maj. MUHLENBERG. I believe those that disqualify it as a fighter are really more serious than those that disqualify it as a bomber. The location of the pilot seat is immeasurably bad.

Senator NEW. That is, the De Haviland 4?

Maj. MUHLENBERG. Yes, sir. I see from the French report we have on the De Haviland that the English De Haviland had a pilot seat in approximately the same place; that is, between the wings and very far in front of the observer's seat. That is unquestionably wrong. I have never sat in a machine in which a pilot could see less than in the De Haviland 4. I have sat in the United States D9, as it is called, which is an alteration of the DH9.

Senator REED. Is that the De Haviland 9? Is that what they call the De Haviland 9?

Maj. MUHLENBERG. It is the United States De Haviland 9 that I am speaking of. It is an alteration of the De Haviland 9. In that ship the gas tank, the main gas tank, and pilot seat, are just inter-

changed. That places the pilot's seat right close to the observer's seat, and it is really a luxury to get into that seat, because you can see so very much from it. A pilot can see very little from the pilot seat of the De Haviland 4.

Senator REED. Is not a pilot whose vision is obstructed as you say it is in the De Haviland 4, at a tremendous disadvantage because of that fact?

Maj. MUHLENBERG. It certainly looks that way to me. I have never done any fighting, but I would certainly hate to be in that position in a fight. The pilot has wings above and below him, and a tremendous motor in front of him. The only way he can see is by bending to the right or to the left, and looking out of the dip that comes in the fuselage expressly for that purpose. It is hard even to land the ship because the vision is so restricted. I have flown a De Haviland a little, and I would not compare its range of vision at all with even the training plane. A training plane is so much better, at least from the rear seat.

Senator REED. What training plane?

Maj. MUHLENBERG. The JN-4 plane. In addition to that, the gasoline tank is located aft of the center of gravity of the machine, and a change in the amount of gasoline produces a change in the center of pressure.

Senator REED. In the balance?

Maj. MUHLENBERG. In the balance, yes, sir, whereas, if you had the gasoline tank forward where the pilot sits now, it would be over the center of balance, and the change in the gasoline contents would not induce a corresponding change in the balance of the ship.

Senator NEW. Do you regard that as a serious matter?

Maj. MUHLENBERG. I regard that as very serious. The only way the pilot and the observer can communicate is by interphone. It is considered vital to have the pilot and the observer close together, so that the observer can stand up and fire his gun and communicate with the pilot at the same time by touch or, if necessary, by word of mouth. Of course, it is hard to communicate by word of mouth, but he could communicate by touch, and should be able to do that.

Senator NEW. Is that all?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Can that tank be changed and the opportunity of the observer to see be improved and these other defects be remedied in that machine? Is it possible to do it in the machine?

Maj. MUHLENBERG. It would take an expert designer to state accurately whether that could be done without doing any harm. It looks on the face of it very feasible in future production, but it would take a designer to say positively whether it could be done. It is being done in the United States D9, and, I believe, in what they call the United States D4, which is an alteration of the De Haviland 4. We have two experimental planes now—the United States D4 and the United States D9, the one being an alteration of the De Haviland 4 and the other being an alteration of the De Haviland 9. In the United States D4, and in the United States D9, both the pilot and the observer are close together, with the gasoline tank in front. Of course, another advantage of the gasoline tank in front is that the pilot in a crash is not then between two millstones as is the case at present, when he is between the motor and gasoline tank, and has practically no chance whatever to come out of the crash alive.

Senator NEW. The longerons of the De Haviland 4 are made of spruce, and objection has been made to this committee that a stronger wood than spruce should be used for this purpose. What is your opinion concerning that?

Maj. MUHLENBERG. Probably ash would be stronger. I am not absolutely certain as to that. I do not think that that is vital enough or dangerous enough to be considered as anything highly important, because that fuselage has stood up in a fuselage test at a factor of about six.

Senator NEW. I call your attention to photograph marked "B," with a dotted line showing the forward end of the fuselage, in which the motor of the DH 4 is located. I would like to ask you if you think this section of the machine is properly supported [indicating on photograph], and if it is strong enough?

Maj. MUHLENBERG. As I have said, the only evidence we have to the contrary is that one forced landing that was made, which caused the motor section to drop forward, but I do not consider that that shows any particular weakness in that section, because the whole fuselage is, to put it tersely, a cigar-box affair, and it is not built to stand a crash. It is built for lightness, and probably has a maximum strength consistent with a certain weight that can be given. In a crash or a bad landing I would expect that fuselage to break almost anywhere. In a heavy pancake landing, for instance, it would not be surprising at all to see the motor drop forward just the way that motor did.

Senator NEW. Don't you think that is equally true of machines of other patterns?

Maj. MUHLENBERG. It would be true, probably, of the American Bristol, but not of other machines; no, sir.

Senator NEW. It is true of the American Bristol and true of the De Haviland 4?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. But not of other machines?

Maj. MUHLENBERG. No, sir.

Senator NEW. In other words, they are more fragile than most?

Maj. MUHLENBERG. It would seem so, although we have only one bad landing to prove it.

Senator NEW. Earlier in the examination you said, in reply to a question I asked, that you did not regard the De Haviland 4 machine as it is at present made as a satisfactory machine?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Just how unsatisfactory is it? Just what is the measure of your disapproval of the De Haviland 4 machine?

Maj. MUHLENBERG. It should not be used as anything but a reconnaissance machine in its present design; that is, the minute any machine of proper, or anywhere near proper, design and capability can be turned out, that machine should be substituted. It (the DH4) is the only ship which has reached production which can even come anywhere near being used for those three purposes, and necessarily its production should not be stopped simply because it is not the top notch in those three lines; that is, as a bomber, fighter, and reconnaissance machine. However, its real use is as a reconnaissance machine.

Senator NEW. In its present condition, is not that its only use?

Maj. MUHLENBERG. It is the only proper use; yes, sir.

Senator NEW. Don't you think that its defects as a fighter are sufficient to warrant its being kept out of that service?

Maj. MUHLENBERG. Not unless we can get something better; no, sir. It should be used as a fighter until we can get something better. In the meantime, something better should be manufactured and developed with all possible speed. There are three styles of fighters being developed, and one is now on the way to the Wilbur Wright field from the Thomas-Morse factory.

Senator NEW. What is that?

Maj. MUHLENBERG. It is the Thomas-Morse design for the Liberty motor. I have not seen it yet. There is another kind that is probably better than that for a fighter. That is the Lepere machine, of which we have two samples.

Senator NEW. Where is that made?

Maj. MUHLENBERG. At the Packard plant in Detroit. That is probably the best fighter.

Senator NEW. That is a two-seater fighter?

Maj. MUHLENBERG. Yes, sir. As soon as that can be brought into production, the De Haviland 4 should be withdrawn from the fighting line.

Senator REED. When you say that this machine should be used in the absence of anything better, you mean that if you had nothing but bows and arrows you had better use them until you could get guns?

Maj. MUHLENBERG. That is the idea exactly.

Senator NEW. This committee has been told that many changes have been recommended in the De Haviland 4, both from Gen. Pershing's headquarters and from other official sources in this country. Are steps being taken to adopt those suggestions?

Maj. MUHLENBERG. I do not know to what extent those changes have been corrected. I do know that I received some time ago a letter from the director of Military Aeronautics embodying all the criticisms and suggestions of Gen. Pershing, with the direction that I submit a list of recommendations and criticisms on his criticisms, and I have that here.

Senator REED. Does that contain the criticisms of Pershing?

Maj. MUHLENBERG. Yes, sir. Undoubtedly, the director of Military Aeronautics has taken steps to see that those changes, or as many of them as possible, shall be made. For instance, Gen. Pershing suggests that the CC gears be abandoned entirely. Gen. Pershing says those gears shipped over there are entirely useless. We have no other synchronizing gear in production at the present time and it would not be possible to get him any other until the Nelson gear, for instance, is put into production.

Senator NEW. What is this gear?

Maj. MUHLENBERG. It is a means of arranging the fixed machine guns so that they will shoot through the propeller.

Senator NEW. It is a part of the synchronizing apparatus?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Gen. Pershing says that it is worthless?

Maj. MUHLENBERG. Paragraph 4, subparagraph c, says:

No spare parts or special tools for synchronizing gears. These gears absolutely useless and can not be repaired here.

He is referring to the CC gears.

Senator REED. Will you now let us have the criticisms of Gen. Pershing?

Maj. MUHLENBERG. Yes, sir. These are the original records of the office, and the letter on top contains the criticisms of my office.

(The papers referred to are in the words and figures following, to wit:)

JULY 17, 1918.

From: Commanding Officer, Testing Department.

To: Director of Military Aeronautics, Technical Section, Washington, D. C.

Subject: Improvements and defects in latest type De Haviland Four plane.

1. De Haviland Four plane No. 32477 flown to this post from Dayton Wright factory June 28, 1918, showed some changes as compared with plane No. 32098, received at this post May 16, 1918, also certain defects not yet corrected.

2. At the factory as it was turned over to the testing department pilot to be flown over here there were certain defects in the plane as assembled, due simply to assembling. These were defects due solely to assembling of the plane which would not show in planes shipped to Europe. Such defects were the omission of cotter keys and the omission of the nut fastening a control pulley on.

3. As delivered here, after having flown over, the propeller was five-eighths inch out of line, causing the motor to vibrate; there was a leak in radiator around top bracket which holds the radiator to top longeron; the lever on the distributor was too long and would not advance all the way; the adjustment screws of the carburetor synchronizer rod were loose, not being fastened with a lock wire; the preaker points adjusting screws came loose on the right distributor; the ignition wire on the switch for the right distributor came loose, causing the motor to run on the left distributor only; two exhaust manifolds nuts were not cotter keyed and came loose.

4. The fabric covering the wings was so loose as to completely change the aerofoil in some cases. This may have been due either to the inferior quality of dope used or insufficient initial tension on the fabric before doping. Acetate dope as used on the present product can not be expected to produce as great a shrinking effect as the old nitrate dope, hence if the same tautness is to be affected in the final product, the initial tension on the fabric must be greater than would be used with the old dope. This is known to be the exact opposite of the facts in at least the Dayton-Wright factory, as their employees have not been putting very much tension on the cloth on stretching it over the frame. In addition to the change produced in the aerofoil by the looseness of the fabric, there is a real danger in this condition, i. e., a danger of the cloth tearing loose from the ribs in the slip stream, as has occurred so frequently at this post. Tight or loose, the fabric is very apt to come loose from the ribs in the slip stream of the Liberty motor, due to the tremendous vibration caused by the propeller; but looseness of the fabric probably increases that tendency, hence it is believed that it is necessary to have fabric at least as taut as the fabric in the training planes.

5. There has been no change in the spacing of the ribs in the slip stream, as it is believed there should be, to provide additional support to the fabric in the slip stream; but the interval between stitches fastening the fabric to the slip stream has been reduced to about 2 inches, which is considered good practice. It is a serious question as to whether fabric of any description is the proper material to use for wing covering in the slip stream of a Liberty motor. This office has found numerous instances of the fabric coming loose in the ribs in the slip streams on three different types of machines, the Le Pere, De Haviland, and American Bristol, all of them having varying degrees of tautness of the fabric. It is possible that decreasing the spacing of the ribs in the slip stream and use of the proper kind of stitching at 2-inch intervals between stitches will solve the problem. This office is about to conduct experiments, using the fabric furnished as a wing covering for the D. H. 4 against a covering composed of coarser linen and a covering of thin wood veneer. The test will consist of running a Liberty motor on the ground in a plane whose surfaces exposed to the slip stream are one-half one kind of material and one-half another. This is being done in connection with somewhat similar experiments being carried on at Dayton-Wright factory and in collaboration with the materials department of the Bureau of Aircraft Production.

6. The nose drift wires still run to the same fitting on each side of the fuselage, without any additional reinforcements to the tie-rods which runs through the bottom longeron and ties in these two fittings, one on either side of the fuselage near the nose. This office has run each of these wires to separate fittings, one at the lower longeron and one at the upper longeron, with tie-rods connecting each pair of fittings through the fuselage.

The factory has substituted $\frac{3}{4}$ -inch chrome nickel steel rod for the $\frac{1}{2}$ -inch cold-rolled steel rod which tie the fittings of the left wing spars to those of the right wing spars. The factory is also substituting a chrome nickel-steel rod for the cold-rolled steel tie rod, as mentioned in first sentence.

7. This office is also strengthening the wing fittings by increasing their size sufficiently to allow putting two bolts of chrome nickel-steel through each spar instead of one bolt

H. C. K. MUHLENBERG,,
Major, Signal Corps.

[Second indorsement.]

DEPARTMENT OF M. A., TECHNICAL SECTION, TESTING DEPARTMENT,
Wilbur Wright Field, Fairfield, Ohio, July 23, 1918.

To: Director of Military Aeronautics, Technical Section, Washington, D. C.
(Through C. O., S. C. A. S., Fairfield, Ohio.)

1. Inclosed herewith is a memorandum report from Capt. R. W. Schroeder, A. S. Sig. R. C., in charge of flying for the testing department at this post, consisting of a series of comments on the faults of the De Haviland Four, as reported in cablegram from Gen. Pershing, No. 1361.

2. The remarks on the Liberty motor made by Maj. Geo. E. A. Hallett, S. C., in charge of the motor test section of this department.

3. So little work has been done at this post with the machine guns on the D. H. 4 plane that very little can be said about Gen. Pershing's comments except in isolated instances. Paragraph 3, subparagraph A, is concurred in heartily by this office. Paragraph 4, a Nelson synchronizer gear recently tested at this post will probably replace the G. C. gear entirely.

4. In addition to the faults mentioned by Gen. Pershing, this office has found the following:

(a) The wing covering is too loose in many cases and in all cases is either not properly fastened to the ribs in the slip stream or is not the right kind of material to use for wing covering in the slip stream. Experiments are now being conducted at this post to determine the serviceability of cloth versus veneer for wing covering in the slip stream. Several cases have occurred of the linen fabric as now used coming loose from the ribs, this always occurring in the slip stream. The probabilities are that wood veneer is the proper covering to use in the slip stream.

(b) Leading edge should be veneered in order to preserve the shape of the aerofoil at this very important portion of the wing. Present practice maintains the proper shape of the aerofoil only at the points where the cap strips support the fabric.

(c) The nose drift wires should run on from bottom of the front of the first strut from the fuselage front to wing, the forward end of the lower longeron and the other from the top of the first strut rear to the fore and of the upper longeron with a compression member in the upper wing between the first struts front and rear. Steel rods such as the tie rods connecting wing spars and the tie rods connecting the nose drift wires through forward end of the fuselage should be of alloy steel instead of cold-rolled steel. This is being done in the new ships.

(d) Wing fittings connecting the wing spars to the fuselage should be stronger and the ends of the spars should be metal capped.

(e) Holes through wing spars should be metal bushed.

(f) There are too many holes in the longerons.

(g) The fitting holding the drift wire which runs from the top of the center section to the longeron is attached only to the top longeron, and should have a wire member distributing this load elsewhere preferably the landing gear.

(h) The fitting attaching the ailerons, rudder, and elevators is not the best. It should have the double fitting instead of the single as the cotter pins take the strains.

(i) Splicing the cables would probably be better than soldering.

(j) A double cable to the elevator instead of a single would be safer.

(k) Aileron pulleys should be inside of the wings and inspection openings provided. The pulleys in their present location offer considerable head resistance and are difficult of inspection.

(l) The pilot's seat and the main gas tank should be interchanged for several reasons, viz: Consumption of gasoline means change of balance of the machine in the present situation, and the pilot can see practically nothing from the pilot's seat as located at present; also communication between the pilot and observer is hampered by the distance separating the two.

(m) The control stick should be of nonmagnetic material to prevent influencing the compass.

(n) The gasoline-control valve should operate with one handle connecting the pressure tank with the engine, the gravity tank with the engine, or shutting off all three. The present arrangement of three valves, all of them hard to operate and not labeled, is crude in the extreme and might very easily lead to fire where the pilot, while on the ground, would inadvertently connect the pressure tank with the gravity tank. This has occurred at this post, fortunately without any conflagration resulting.

H. C. K. MUHLENBERG,
Major, Signal Corps, Commanding Department.

WAR DEPARTMENT,
TECHNICAL SECTION,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
June 28, 1918.

From: Office Director of Military Aeronautics.

To: Commanding officer, Testing Squadron, Wilbur Wright Field
(Through commanding officer, Wilbur Wright Field, Fairfield, Ohio).

Subject: Cable No. 1361, from Gen. Pershing.

1. Forwarded herewith is a copy of Gen. Pershing's cable, No. 1361, for remark and recommendation.

2. Early action is requested.

By direction of Maj. Gen. Kenly.

THURMAN H. BANE,
Lieutenant Colonel, Signal Corps.

[First indorsement.]

HEADQUARTERS, S. C. A. S.,
Fairfield, Ohio, July 2, 1918.

To: Maj. H. C. K. Muhlenberg, S. C., Test Department, Fairfield, Ohio.

1. Forwarded for remark and recommendation.

By order of Lieut. Col. Duncan.

C. H. REEVES, Jr.,
Captain, A. S. Sig. R. C., Adjutant.

TECHNICAL SECTION FOR INFORMATION,
June 24, 1918.

(Received June 26, 1918.)

(For Director, Military Aeronautics.)

Paragraph 1, copy to Chief of Ordnance.—D. H. 4 plane has been carefully examined. Plane structure has been found defective as follows:

Subparagraph A. Rubber cords for shock absorbers incorrectly made; rubber strands not put under sufficient tension before covering with braiding. Result is that estimated weights too much for under load.

Subparagraph B. No check cables have been applied to check axles from forceful striking threats of running gear V. — struts which are permitted to strike ground, crashing machines in landing.

Subparagraph C. Tail plane is of old type and should be braced with stream line tubes extending from leading edges to lower longeron of fuselage. Possibly this old type tail plane should be replaced by new type made of all spruce and having no joints near curves in leading edges. With new type tail plane stream line tubes will not be necessary.

Subparagraph D. Wood screws have been used in various places instead of bolts, notably on washer plates at points where tail advancing without tubes passes through fuselage and on wing skid fastening.

Subparagraph E. Nuts have been omitted in securing bolts.

Subparagraph F. Bolts, shackles, and cotter pins throughout the machines are in many cases loosely and badly fitted.

Subparagraph G. Cotter pins have been substituted for buffers.

Subparagraph H. Wing skids badly fitted and ash packing blocks omitted.

Subparagraph J. Main compression ribs in the main plane are of hollowed out type with 3-ply web. These should be solid spruce to prevent flange from bulging up.

Subparagraph K. No fairing placed between double fly wire. All these wires should be of stream line type and not of cable.

Subparagraph L. Washers under fixing bolts of ailerons pulleys wheels omitted, allowing aluminum packing to penetrate into ribs at leading edges.

Subparagraph M. Tail skid shock absorber wound so tight that skid throws great strain on cross members of fuselage. Rubbish plate for this skid extends only about 6 inches compared with 18 inches extension fitted in England.

Subparagraph N. There is one-eighth inch extension fitted in England.

Subparagraph O. There is one-eighth inch play in hinge of tail plane. This fitting should be made snug to take all play away.

Subparagraph P. Cotters and split pins were used in adjustment of tail hinge instead of bolts and nuts.

Subparagraph Q. Stream-line covers were omitted from fin and empennage.

Subparagraph R. In center section main plane fixing bolts are a very loose fit in spar.

Subparagraph T. Wrapping of wire terminals in some cases bad.

Subparagraph U. Pilot's wheel on tail planes should be bolted and not secured with lag screws.

Subparagraph V. Ashes temporarily have been omitted from axles, which break.

Subparagraph W. Air speed indicator heads are heavy and glassy and this instrument is virtually worse as at present fitted.

Subparagraph X. Cables and pulleys should be thoroughly greased, and not come dry.

Subparagraph Y. Such thing as jammed pulley wheels and joints in landing gear structure show faulty inspections.

Paragraph 2. Liberty motor is defective, indicating shop inspection not satisfactory. Lincoln apparently better than Packard.

Subparagraph A. Open carburetor inlet not safe and neither British nor French will use them. Imperative arrange gasoline tightly piped to carburetor and drain it outside fuselage.

Subparagraph B. Flight tests in England supervised by Capt. Munford indicate Zenith 52 carburetors not satisfactory and cheaply made but better results from Claudel.

Subparagraph C. Water pipe from bottom radiator to pump should be moved to starboard to clear oil strainers.

Subparagraph D. Copper tube vents for oil tanks should be $\frac{1}{8}$ inch. Oil tanks burst in service because this tube too small.

Subparagraph E. Vent for radiators must have a tube leading water where it can not blow on spark plug or pilot and vent should not be in radiator caps.

Subparagraph F. Oil tubes from tanks to pumps must be 1 inch or larger and plug for draining oil tanks should be 1 inch. The present sizes will not work in cold weather.

Subparagraph G. Gasoline tube to carburetors not secure against vibration and hose connections to carburetors not secure against detachment. Small pieces of rubber have been found in gasoline tubes and have caused forced landing. There should be strainers in carburetors.

Subparagraph H. Priming tubes and thermometer tubes over manifold should be placed so as to leave carburetors accessible.

Subparagraph J. Oil tubes between cylinders should be secured to crank case.

Subparagraph K. Interchanging positions of switches and all high speed indicators so that switch operates with left hand and close to control lever.

Subparagraph L. Engine control lever and mounting not rigid enough.

Subparagraph M. Battery boxes does not protect against short circuit.

Subparagraph N. Present system main gasoline tank under air pressure should be changed because of danger from fire and because if punctured above liquid level by rifle bullet pressure is lost. Suggest enlarging needle valve on carburetor and altitude adjustments and use of gravity feed tanks in upper wing or pumps between tanks and carburetors. Overflow for gasoline from upper tanks should be conducted to point at least 6 feet from exhaust and visible by pilot. One plane destroyed by fire due to this defect.

Paragraph 3. Following defects have been found in armaments.

Subparagraph A. Scarf mounts for Lewis guns badly designed, vertical release should not operate until after horizontal release. Regarding arrangements necessitates gunner supporting entire weight of magazine and gun when turning mounts.

Subparagraph B. Quadrant scarf mounts entirely too light; guns jump badly when fired.

Subparagraph C. Fixed gun mount fastenings inaccessible and not properly locked in place. Removal and replacement of fixed gun destroys alignments of barrels. Gun can not be adjusted so that barrels are parallel to line of flight and still permit line of sight to clear radiator.

Subparagraph D. Sight mountings for fixed guns light enough and * * * require special tools to attach. Aldis ring sight mountings inconveniently placed, can not be used by pilots.

Subparagraph E. Oil cover Aldis sight does not stay open.

Subparagraph F. No side doors in ammunition boxes for arrangement of ammunition.

Subparagraph G. Fastenings of ammunition boxes not secure.

Subparagraph H. Front-sight brackets Lewis gun will not stay in place.

Paragraph 4. Synchronizing gears entirely useless.

Subparagraph A. Reservoir badly made; must all be replaced. Low-pressure valves in very bad condition. High pressure cylinder cuts cup leathers due to bad machining. Several high pressure springs have broken, apparently defective. High pressure pipe connections broke in several cases, badly designed.

Subparagraph B. Gear arrived filled with grit, with cup leathers dried up and useless, and with all three-way valves leaking.

Subparagraph C. No spare parts or special tools for synchronizing gear. These gears absolutely useless and can not be repaired here.

Paragraph 5. Bomb carriers not sent with planes. We understand that these are in transit.

Subparagraph A. Sample bomb carrier sent by courier has no release mechanism or device to steady bombs.

Paragraph 6. Marlin guns not in good condition; require a careful inspection and overhauling.

Subparagraph A. Many Marlin guns have defective gear springs. Great variation in length of action spring Marlin guns cause variation in rate of fire.

Subparagraph B. No spare parts for armaments received.

Paragraph 7. None of the above planes can be used until some of above changes are made, causing vital delay in program.

Subparagraph A. Planes sent here must be inspected and thoroughly tested before being shipped.

Subparagraph B. Appropriate spares, too, must accompany them.

Subparagraph C. When operating this far from base of supply it is essential that defects which are discovered by inspection in the United States be corrected there.

PERSHING.

Senator NEW. Do you regard the work at the factory making the De Haviland four planes as satisfactory?

Maj. MUHLENBERG. Improving, I should say, but not wholly satisfactory. It is improving rapidly. They show themselves willing on every hand to come around and improve their methods where they are faulty.

Senator REED. That is, if you catch them they do not do it again right away?

Maj. MUHLENBERG. That is a terse way of putting it; yes, sir.

Senator NEW. Improving that would certainly indicate that it has not been all that it should have been.

Maj. MUHLENBERG. No, sir. For instance, I submitted to the Director of Military Aeronautics a letter which I am afraid I have not with me, describing a fault that we found in the old plane. There were three holes drilled through one wing spar. There should have been only one. Evidently the first one did not fit, so they drilled another. That did not work satisfactorily, so still another was drilled. That was an old ship. We have since seen no signs of that. They may be there, but we have not discovered a repetition of that particular defect. That is why I say they are improving.

Another trouble, I should say, is in the slip stream. We have trouble keeping the fabric on the ribs. The factory has not changed the stitches; that is, they have changed the interval between the stitches. You can probably see that in photograph "C." It was originally about 4 inches. The factories voluntarily reduced that to 2 inches, which makes more work, but it is safer. They have since changed the method of stitching and have put a binding strip on the fabric before they stitch it, and then another binding

strip is put over the stitches. They have done that. While I do not know whether it is the result of observation of our work at Wilbur Wright Field, or what has been the reason for it, they have done it.

Senator REED. Subparagraph V says: "Ashes temporarily have been omitted from axles which break." Just what does that mean?

Maj. MUHLENBERG. I can not say.

Capt. SCHROEDER. That is hollow tubing. They are probably using spruce instead of ash. Ash is now being used.

Senator NEW. Is it not true that Gen. Pershing in his report enumerated changes which should be made in the De Haviland four machine and recommended that it be not used until after that list of changes had been made?

Maj. MUHLENBERG. He did; yes, sir. In paragraph 7 he says:

None of the above planes can be used until some of the above changes are made, causing vital delay in program.

Senator NEW. Do you agree with that?

Maj. MUHLENBERG. Yes, sir; especially as there are some changes which should be made which he has not mentioned at all in his report.

Senator NEW. You say there are some changes which he has not mentioned?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Which are substantial in character?

Maj. MUHLENBERG. Yes, sir; they are every bit as necessary as those mentioned in his report. For instance, the nose-drift wires and the fabric. Those changes should be made immediately.

Senator NEW. Before the machine is used at all?

Maj. MUHLENBERG. Yes, sir. We are making those changes at the Wilbur Wright Field as fast as we can make the changes before we fly the machines.

Senator NEW. How many machines were sent abroad before these changes were reported or recommended?

Maj. MUHLENBERG. That I do not know. All I know is that the Dayton-Wright factory alone is now producing in the neighborhood of 20 ships a day.

Senator NEW. Were those changes made?

Maj. MUHLENBERG. Some of them, possibly. How many I do not know. There are some that are not being made. I know that those nose-drift wires have not been changed.

Senator NEW. And yet you regard that as one of the most important changes that has been recommended?

Maj. MUHLENBERG. Yes, sir. I reported to Washington, after receiving hearsay evidence on the subject, that the change was being made in production. I was told so by one of the factory employees, I believe, but I have since been told, without any accounting for the failure to make the changes, that they have not been made. I have not had an opportunity to investigate that at all because I simply heard it yesterday or the day before.

Senator NEW. You have not yet seen a copy of the report filed by Capt. McCorcker?

Maj. MUHLENBERG. No, sir.

Senator NEW. Who conducted the tests at Miami, Fla.?

Maj. MUHLENBERG. No, sir.

Senator REED. Maj. Muhlenberg, you have, at the command of the committee, furnished us with a paper dated June 24, 1918, and marked "Received June 26, 1918," purporting to be a copy of a cable from Gen. Pershing; that is correct, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. That was transmitted to you in the letter which is attached, and which is dated June 28, 1918, and is signed by Lieut. Col. Thurman H. Bane?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And, then, attached to these documents is your own reply, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Your reports are contained in the two documents?

Maj. MUHLENBERG. That is all the same document. There are two copies of the last page.

Senator REED. Your report is contained in the document which bears the date of July 23?

Maj. MUHLENBERG. Yes, sir.

Senator REED. These documents, you have stated, you desire to keep. The committee will have to keep them overnight in order to copy them and return them to you.

Maj. MUHLENBERG. Yes.

Senator REED. Have you any other reports or have you written any other letters?

Maj. MUHLENBERG. I have also a letter dated July 17, 1918, from myself to the Director of Military Aeronautics, on the subject of defects noted in the De Haviland 4 planes received at the Wilbur Wright field.

Senator REED. What suggestions have you to make with reference to a way out of these difficulties?

Maj. MUHLENBERG. The relegation of the D. H. 4 to use as a reconnaissance machine solely, the speeding up of the production of the LePere machine, and the adoption of that, probably, as a fighter, and the development of the U. S. D-9 to the point where it can be used as a day bomber.

Senator NEW. That means practically discarding the De Haviland 4 as a day bomber and as a fighter?

Maj. MUHLENBERG. Yes, sir; it means discarding it as a day bomber and as a fighter. It is possible that the U. S. C. B.—Curtiss battler—may be a good fighter. I have not seen it. I have only seen the drawings, but I do know that the LePere is giving promise of being an excellent fighter.

Senator REED. It has been suggested that there should be created a division of aeronautics separate from the rest of the Army or Navy, as the Army is separate from the Navy to-day.

Maj. MUHLENBERG. Yes, sir.

Senator REED. And that at its head should be placed an officer who would have a corps of men under him or with him, so that he will have a complete organization, not so large as but similar to that of the Army or Navy?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And the men in this Aviation Service then would progress along the lines in this separate department and they would not be subject to the control of men sent into the service, who are

utterly unfamiliar with it. That suggestion has been made. What do you think of it?

Maj. MUHLENBERG. There is only one possible way to feel about it, and that is to be in favor of it. Knowing as little about the subject as we do in this country, we can but take the advice and profit by the experience of our foreign allies. France and England have found that system preferable to anything else, and the chances are that we will later have to adopt it, so why not adopt it immediately. The sooner we adopt some air-service system and get down to that organization the better off we will be.

Senator REED. You have spoken of two or three types of machines that we should get into production on as soon as possible. Why should we not adopt and begin to manufacture at once some of the approved European machines that have been tested, such machines as the Spad and the Nieuport and the Briguet, and other types of planes that have been successful?

Maj. MUHLENBERG. You can not use those with the Liberty motor, of course. We have got to create a plane for the Liberty motor.

Senator REED. Then why not create some motor for some plane and get at this thing? We have spent a year and a half nearly on the Liberty motor. There is a place in this country where they make the Hispano-Suiza engine, as I understand it.

Maj. MUHLENBERG. It is a good motor, too.

Senator REED. Why not get those machines as fast as we can and begin to give our men something that will work?

Maj. MUHLENBERG. We, at the Wilbur Wright Field, are endeavoring to rush as fast as we can the testing of the English Bristol, using the 300-horsepower Hispano-Suiza motor. We think that will be a good fighter. I would not be surprised at all if that ultimately proved the possible solution; that is, the English ship and the Hispano-Suiza motor. The motor is a known motor, but there is no production of those machines. It will take some months to get production on those machines. There are only about 10 in the country.

Senator REED. If we had started a few days after we declared war we would have them in production by this time.

Maj. MUHLENBERG. I should say so; but the motor, until very recently, was more or less experimental.

Senator REED. You mean the 300-horsepower motor was experimental?

Maj. MUHLENBERG. Yes, sir.

Senator REED. But the 175 and the 200 horsepower motors were not experimental?

Maj. MUHLENBERG. No, sir.

Senator REED. They had been used by the French with great success in fighting over the lines in the Spad machines, had they not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Could they not have been procured?

Maj. MUHLENBERG. I do not know, sir.

Senator REED. If we had put some of the energy on them that we put on the Liberty motor, we could have got them.

Maj. MUHLENBERG. I think so. If we get a plane that will take the Liberty motor, there is not anything to beat it, because it is

turned out in such production as the Hispano-Suiza motor never dreamed of.

Senator REED. Did anybody ever try to produce the Hispano-Suiza motor in this country? What is there about it that makes it impossible to produce it in quantity? I have looked at that side of the question, but I can not understand that. They are fundamentally the same in principle, are they not?

Maj. MUHLENBERG. If you do not design a motor for production, you will never arrive at the same production you would if you designed with that end in view. The Hispano-Suiza has not been designed with that end in view, because the French are much more prone to put handwork on their machinees than we are.

Senator REED. But they have got some of that French handwork flying on the lines and we have not an American-made machine, have we?

Maj. MUHLENBERG. No, sir; not unless they are De Havilands.

Senator REED. I want to go back to the question of reducing the size or the number of cylinders in the Liberty motor. Has that been given real consideration?

Maj. MUHLENBERG. At McCook field an experiment is now being conducted with a brand-new English-built Bristol with a Liberty 8 motor in it. That is going to be tried out. They are going to try out the same ship with the Hispano-Suiza 300-horsepower motor. The Liberty 8 developed something like 250 to 300 horsepower. That is being tested. One is to be tested against the other. The Liberty 8-cylinder motor would, of course, have the advantage of much greater production than the Hispano-Suiza motor.

Senator NEW. One final question: Do you, of your own knowledge, know how many American combat planes are in use to-day on the battle front?

Maj. MUHLENBERG. No, sir.

Senator REED. He said that he did not know of any there.

Senator NEW. I did not understand him to say so. Major, you spoke of the De Haviland 4 as a reconnoissance machine.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Just what character of work is done by a reconnoissance machine?

Maj. MUHLENBERG. Principally aerial photography.

STATEMENT OF CAPT. R. W. SCHROEDER.

Senator NEW. State your full name.

Capt. SCHROEDER. Capt. R. W. Schroeder.

Senator NEW. You are connected with the Signal Corps?

Capt. SCHROEDER. Yes, sir; Aviation Section.

Senator NEW. Where are you located now?

Capt. SCHROEDER. At the Wilbur Wright field.

Senator NEW. How long have you been in the service, and how did you happen to come into the Army?

Capt. SCHROEDER. Through previous experience in aviation.

Senator NEW. You were an aviator before you joined the Army?

Capt. SCHROEDER. An aeroplane mechanician.

Senator NEW. What experience had you had and where?

Capt. SCHROEDER. In 1910, and up to the fall of 1915, I had experience along this line.

Senator NEW. Where were you employed?

Capt. SCHROEDER. Two years at the Franco-American Aviation Co.

Senator NEW. Where is that?

Capt. SCHROEDER. Chicago, Ill. We conducted a school there and built planes with the help of the students, and occasionally we gave exhibition dates.

Senator NEW. You are a flyer?

Capt. SCHROEDER. Yes, sir.

Senator NEW. Have you a pilot's license?

Capt. SCHROEDER. No, sir.

Senator NEW. Or did you have?

Capt. SCHROEDER. No, sir.

Senator NEW. You are a practical flyer?

Capt. SCHROEDER. Yes, sir.

Senator NEW. How long have you been connected with the Army?

Capt. SCHROEDER. Since the fall of 1916—October, 1916.

Senator NEW. You have heard the evidence that has just been given by Major Muhlenberg, have you not?

Capt. SCHROEDER. Yes, sir.

Senator NEW. Do you agree with that in the main, and if you disagree with it in any point, please state where and in what respects you differ?

Capt. SCHROEDER. I agree with everything and can add something, probably, with reference to the inspection that is being made at the factories.

Senator NEW. You have handed the committee two photographs, one marked 559. Please state what this represents and what it reveals.

Capt. SCHROEDER. That is the condition that we found in checking a machine.

Senator REED. What kind of a machine?

Capt. SCHROEDER. A D H 4. To verify Gen. Pershing's criticism, on pulling off one of the strips of one covering to examine the box which Gen. Pershing speaks of, we found that the rib was cracked. It is subparagraph J. This crack is revealed here in that photograph. It would show more plainly here [indicating on photograph]. There is a strip that was torn off. The cloth is under tension, and it now shows the rib pulled right open. That is the rib there [indicating]. This is the first condition after the strip was removed.

Senator REED. You are now referring to the photograph that you have just spoken of?

Capt. SCHROEDER. Yes, sir.

Senator REED. You mean to say that it shows the condition of the crack when the covering was first removed from the wing cover; that is, the binder strip was first removed from the wing cover over the box rib?

Capt. SCHROEDER. Yes, sir.

Senator REED. Does that show the very weakness that was pointed out by Gen. Pershing?

Capt. SCHROEDER. Yes, sir.

Senator REED. You found it in the first machine you opened?

Capt. SCHROEDER. Yes, sir.

Senator REED. The crack was there and was covered up so that a man could not see it except by taking the cover up?

Capt. SCHROEDER. The only way he could see it was to remove the cover.

Senator NEW. Were any other machines inspected for the same defect?

Capt. SCHROEDER. Yes, sir; but we found no other machine in such condition.

Senator NEW. You found no other machine in such condition? You found it in the first one only?

Capt. SCHROEDER. Yes, sir; but none in the rest. On removing this cover, we found the crack closed up. It shows that the tension of the cloth is splitting the rib open. The cloth does not go across the rib as shown in the photograph. One edge of the cloth is tacked on one edge of the rib and the other edge of the cloth is tacked on the other edge of the rib.

Senator REED. It should go over?

Capt. SCHROEDER. Yes, sir.

Senator REED. If it went over it would tend to hold the wood back instead of pulling apart?

Capt. SCHROEDER. Yes, sir.

Senator NEW. In connection with photograph No. 559 you have also submitted others, one numbered 557 and another 558, showing the same part of the machine after the cloth is removed?

Capt. SCHROEDER. Yes, sir.

Senator NEW. And the comparisons of which you are speaking are made between 558 and 559?

Capt. SCHROEDER. Yes, sir.

Senator NEW. And also photograph 557?

Capt. SCHROEDER. Yes, sir. From photograph 559 it is quite evident that the inspectors on this particular job did not observe that tacks were being used to attach the wing covering to the rib. In no place on the wing are tacks used on ribs.

Senator REED. You mean they should not be used?

Capt. SCHROEDER. Yes, sir.

Senator NEW. You mean they should not be used in any place?

Capt. SCHROEDER. No, sir.

Senator NEW. Why not?

Capt. SCHROEDER. These tacks that were placed on this job caused the rib to crack as the cloth shrunk.

Senator NEW. The tension caused by the shrinking of the cloth and the perforation made by the tacks caused the rib to split?

Capt. SCHROEDER. Yes, sir. As this binder strip was pulled off the cloth let go the ribs in a number of places, as indicated in this photograph. The tacks fell out on the floor. In photograph 557 you can see the opposite side of the wing of this De Haviland 4 plane, which shows—

Senator NEW. The opposite of that shown in photograph 559, you mean?

Capt. SCHROEDER. Yes, sir. These photographs show practically the same condition, only that the wood in the rib has not shown any signs of splitting as yet. However, it does indicate that the cloth is not attached, but it is tacked on two individual edges. This condition has never existed in any other ship on our field.

Senator REED. Could that ship have passed out of the factory in that condition if there had been proper inspection?

Capt. SCHROEDER. No, sir.

Senator REED. Do you agree with the statement made by Maj. Muhlenberg that there are two inspectors, or should be two inspectors in these plants, one representing the Government and the other representing the factory, each of them having opportunity, under proper inspection, to see the entire construction of the machine before any part of it is covered up?

Capt. SCHROEDER. Yes, sir.

Senator REED. What else have you to say about the defects in these machines?

Capt. SCHROEDER. They have all been brought out by Maj. Muhlenberg very much along the same line. This one particular instance was in addition to his.

Senator REED. You agree with all that he said in regard to the defects of this machine?

Capt. SCHROEDER. Yes, sir.

Senator REED. Is it your opinion that the machine at the present time is of such character that you can say it is a proper machine in which to send our boys up to do battle?

Capt. SCHROEDER. No, sir.

Senator REED. You do not think it is?

Capt. SCHROEDER. It is not.

Senator REED. You think if a man goes up in the air and risks getting killed by another man, or being shot down, that he ought not to take the additional risk of having an accident because of a bad machine of his own, if it can be avoided?

Capt. SCHROEDER. If it can be avoided we will stay away from it.

Senator REED. It has been stated to me that the woodwork of the machines ought to be built by men who are skilled cabinetmakers, and that the construction of these machines is of such character as to indicate that they had been put together by rough woodworkers. What do you think of that?

Capt. SCHROEDER. From all indications the workmanship in the plane is being done by rough mechanics. I dare say that it is being done by men who know little, if anything, about woodwork.

Senator REED. Have you observed that kind of workmanship in planes that have been turned out in other factories than the Dayton-Wright factory?

Capt. SCHROEDER. I noticed very poor workmanship in connection with the American built Bristol, especially in the woodwork.

Senator REED. That was turned out from where?

Capt. SCHROEDER. The Curtiss factory.

Senator REED. Are the flyers at the field, speaking of them generally, satisfied that these machines are safe, or do they dread using them?

Capt. SCHROEDER. In carrying out our orders on the field they carry them out in a way that would lead me to say they were glad when it was over with. On each test I have noticed that when we send them up to find out something that will probably take about 20 minutes, if we tell them that at the end of 15 minutes if they do not find what we want they can come down, they generally come down at that time.

Senator REED. And you tell them because you do not like to send these boys up in the air with these machines?

Capt. SCHROEDER. They will do our work.

Senator REED. I say the reason that you tell them to come down as soon as they discover what you want is that you yourself regard it as a dangerous thing to send these young men up in these machines?

Capt. SCHROEDER. Yes, sir.

Senator REED. I will ask Maj. Muhlenberg if he agreed to that statement.

Maj. MUHLENBERG. Absolutely; yes, sir.

Senator REED. Now, Lieut. Foote, I would like to have an expression of opinion from you while you are here, so that I may cover this question completely. Is that your judgment about these machines?

Lieut. FOOTE. I think I would be very safe in saying that every pilot at our field, without exception, is very leary of these machines.

Senator NEW. Leary of them because of experiences with them: is that right?

Lieut. FOOTE. No, sir; but more because of the facts that have been laid before them.

Senator NEW. That is what I mean. To put it another way, they would not be in the same frame of mind and entertain the same distrust with respect to other machines of other types; is that true?

Lieut. FOOTE. Yes, sir.

Senator REED. That is what you mean? They are not afraid to go into the air, and they are not afraid to make tests if they are given a good machine; is that what you mean, Lieutenant?

Lieut. FOOTE. Yes, sir. They have seen so many faulty things in the construction and performances of the De Haviland machine that they have become more than leary of it. It shows it when you fly it. When you hold it on a straight away course for 20 minutes you can feel the strain it is under. Of course, there are a lot of things that are covered up. If the men could see them, maybe they would not stay up that long.

STATEMENT OF LIEUT. JOHN M. FOOTE.

Senator NEW. Lieutenant, will you give your full name and state the position you occupy?

Lieut. FOOTE. First lieutenant, A. S. S. O. R. C.

Senator NEW. How long have you been connected with the Army?

Lieut. FOOTE. I made application in 1916 and started flying in 1917, in January and February.

Senator NEW. Are you a graduate of one of the Government schools?

Lieut. FOOTE. Yes, sir; a graduate of the Memphis school. That was the Billings field and fairground in 1917.

Senator NEW. You have been a practical flyer?

Lieut. FOOTE. Yes, sir.

Senator REED. What was your occupation before you took up aviation?

Lieut. FOOTE. I was in the automobile business.

Senator REED. Were you a mechanic?

Lieut. FOOTE. Yes, sir. I could not say that I was an aeroplane mechanic. But I was thoroughly familiar with the gas engine, and with automobiles.

Senator NEW. With what machines have you had experience as a flyer during and since your period of training?

Lieut. FOOTE. I have flown the Curtiss training planes, the De Haviland, the L. W. F., the Curtiss R-4, the Wright-Martin, the Standard, the Sturtevant. In scouts I have flown the Robbins-Schaefer the Standard M Defense scout, the Ordnance scout and the L. W. F. Liberty battle plane.

Senator NEW. Do you share the feeling of distrust of the De Haviland 4 that is spoken of as being entertained by the pilots at the Dayton-Wright field?

Lieut. FOOTE. Yes, sir.

Senator NEW. You feel that same distrust with reference to any of these other planes that you have spoken of as having had experience with?

Lieut. FOOTE. I have felt it in one scout that is improperly built, but that was never put into production. I never felt that way about a production ship.

Senator REED. What was the one that you felt that way about that was never put into production?

Lieut. FOOTE. The Robbins-Schaefer scout, made in San Diego, Cal. They only built one of them.

Senator REED. You have heard the testimony given by Maj. Muhlenberg and Capt. Schroeder?

Lieut. FOOTE. Yes, sir.

Senator REED. Do you agree with that?

Lieut. FOOTE. Yes, sir.

Senator REED. Do you disagree with it at any point?

Lieut. FOOTE. I might say that with regard to a number of things I think they are quite modest in their criticisms.

Senator REED. In what, for instance? Do you mean that they understated the criticisms of the machine?

Lieut. FOOTE. No, sir; not that they understated them, but that they gave it the benefit of the doubt. They give the machine the benefit of the doubt at every turn.

Senator REED. That is what I mean.

Lieut. FOOTE. Yes, sir.

Senator REED. Tell us what you think about the machine, in your own way?

Lieut. FOOTE. Personally, I think that the machine is wrong in design as well as production. It is not designed for a bombing machine, which is one of the missions it is supposed to fulfill.

Maj. MUHLENBERG. Lieut. Foote flew it in a bombing test that Capt. Riley Scott conducted. Lieut. Foote was the pilot.

Senator NEW. Let me ask you if you have flown the machine in a bombing test?

Lieut. FOOTE. Yes, sir.

Senator NEW. On what occasion and with whom as a bomb dropper?

Lieut. FOOTE. I conducted a bombing test of the De Haviland 4 with Mr. Scott at the Wilbur Wright field in the middle of July, 1918.

Senator NEW. The middle of the current month?

Lieut. FOOTE. Yes, sir.

Senator NEW. What seemed to be the objection to it?

Lieut. FOOTE. In the first place, the machine is constructed so that the pilot has absolutely no way of accurately sighting the target. This is due to the construction of the fuselage, in that you are not able to cut the holes needed in the fuselage because of weakening it.

Senator NEW. And the result of that is that the pilot can not see?

Lieut. FOOTE. Yes, sir. The pilot has no vision of the object that they are bombing, and he can not follow the object and pass it up to the observer. This is due to the limited scope of the pilot's vision, which is very poor in this machine. The view of the pilot is limited in this machine. There are so many blind angles. A second reason is the distance between your observer and your pilot. The third reason is the unfavorableness of the machine with reference to placing the bombing sight on things; that is, there is no suitable place for the bombing sights.

Senator REED. What are your criticisms of this machine for other purposes than bombing? What is your criticism of it as a fighter, for instance?

Lieut. FOOTE. Owing to the weaknesses shown by Maj. Muhlenberg, it would be absolutely unsafe to do any maneuvering with it. For that reason alone it would be unfit for a fighter.

Senator NEW. The machine is not stable enough?

Lieut. FOOTE. Yes; on account of such things as the fittings on the drift wires, the weakened construction of your wings and your faulty wing spars. I have seen one wing spar that was spliced in two places—one main wing spar.

Senator NEW. Was that the fault of design or the fault of manufacture?

Lieut. FOOTE. Well, the double spliced wing spar was the fault of production.

Senator NEW. It was not design?

Lieut. FOOTE. No, sir. It just has a specified wing spar of such and such dimensions, but it is generally the rule in production that the wing spar shall not be spliced in two or three places. It makes it weak.

Senator NEW. Is the machine sufficiently speedy to make it a first-class fighter?

Lieut. FOOTE. At a high altitude, in my opinion, it is not.

Senator NEW. Do you know what its accredited speed is at different heights?

Lieut. FOOTE. If I am not mistaken it has a speed of somewhere around 83 miles an hour at 15,000 feet. As a fighter the D H 4 has a speed, an indicated air speed, of 117 miles an hour at 2,460 feet. It has an indicated air speed of 105 miles an hour at 7,770 feet, and an indicated air speed of 96 miles an hour at 10,780 feet. Now, I will give you the true air speed. The true air speed for 2,460 feet is 120 miles an hour; for 7,770 feet it is 117 miles an hour; for 10,780 feet it is 113 miles an hour, and for 15,740 feet it is 106. That is the true air speed.

Senator REED. Then its true air speed is better than the indicated air speed?

Lieut. FOOTE. That is the real speed.

Senator REED. I say it is better than the indicated speed; its performance is better?

Senator NEW. What is the report from which you are reading?

Lieut. FOOTE. This is the performance of the De Haviland 4 plane numbered 32098.

Senator NEW. By whom was that test made?

Lieut. FOOTE. It was conducted by Rader.

Senator NEW. Philip Rader?

Lieut. FOOTE. Yes, sir.

Senator REED. What is the ceiling?

Lieut. FOOTE. The ceiling for the fighter was 19,773 feet in 66 minutes and 23 seconds.

Senator NEW. Is that the De Haviland?

Lieut. FOOTE. As a fighter.

Senator REED. Is not that slow climbing?

Lieut. FOOTE. It is quite slow, in my opinion.

Senator REED. In modern fighting, is it not true that the fighter has to get this great altitude of even 19,000 feet and higher?

Lieut. FOOTE. 19,000 feet is a pretty good altitude. My idea is that 19,000 feet is about the maximum altitude for a battle plane. It is seldom as high as that, as I understand it. I have never been over there, so I do not know much about it. I would not like to state positively.

Maj. MUHLENBERG. They are getting a theoretical ceiling of 25,000 feet with the English Bristol.

Senator REED. What do you say of this machine for reconnoissance work?

Lieut. FOOTE. I know very little about reconnoissance work, so I would not care to state my views on that. I have done absolutely none of it. I would like to state, in regard to the battle planes, that I think with the mounting of the guns on the De Haviland 4 at the present time they will be absolutely useless.

I tried to use the fixed guns that are on the synchronizing device. From the pilot's seat it is impossible to pull back your charging handle in order to cock these guns; also, the present situation of the range sight is very unfavorable.

Senator NEW. It has been stated before this committee that the compass of this machine is absolutely useless. Do you know anything about that?

Maj. MUHLENBERG. I just rendered a report to the Director of Military Aeronautics stating that I thought we were splitting hairs on the question of the compass; that properly compensated, as it stands, and with the ship properly swung, and with a nonmagnetic joy stick, the compass, right where it is, can probably be used for any trip that the De Haviland 4 can make. We have made cross-country trips with it in just this way. We have done it with the compass at the pilot's left knee, which has been found to be the position most free from outside influence. If you take a day when there is very little wind a pilot can make his destination in a 250-mile flight. Maj. Ocker tried to fly from Washington to Dayton and found himself, when he was forced to land, about 40 miles out of his course. He had flown approximately 250 miles without going by anything but his compass and subject to the winds that prevailed, so that was

a pretty fair test. I have summarized the situation by saying that we can use the compass at the pilot's left knee probably absolutely free from outside influences, or for as long a trip as the De Haviland 4 can make with the compass in its present position. The problem is not so much to get a perfect compass as it is to get a pilot who will use the compass. The pilots from France say that the pilots there do not use them under any circumstances except when they get into a fog. They do not even use them at night. I dare say that Capt Schroeder and Lieut. Foote prefer not to use them. We have difficulty in getting them to use the compass, simply because they are prejudiced against the compass. They do not want to use it. They do not want to use any instrument if they can avoid it. They fly by the terrain and the ship rather than by instrument.

(Informal discussion followed which the reporter was directed not to record.)

Senator New. Lieut. Foote, I would like to ask you, as a final question, whether your approval of what Maj. Muhlenberg and Capt. Schroeder have said or testified to, extends to their belief that the De Haviland 4 ought to be relegated for all purposes except that of reconnaissance.

Lieut. Foote. I would say for all purposes that I am familiar with. I am not familiar with reconnaissance work, so I can not say with regard to that, but for any purpose connected with fighting or bombing, I should say it should.

Senator New. That is, that it should not be used.

Lieut. Foote. Yes, sir; it should not be used.

Senator New. I think that is all.

(Whereupon, at 5.30 o'clock p. m., the committee adjourned until Thursday, August 1, 1918, at 10.30 o'clock a. m.)

AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 1, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 10.30 o'clock a. m. pursuant to adjournment, in the committee room, Capitol Building, Hon. Harry S. New presiding.

Present: Senators New and Reed.

STATEMENT OF MAJ. C. K. REINHART.

Senator New. Please state your name and rank.

Maj. REINHART. Maj. C. K. Reinhart, Aviation Section of the Signal Corps.

Senator New. At the present time?

Maj. REINHART. Commanding officer of the first provisional squadron, headquarters, Hazelhurst Field, Mineola, Long Island.

Senator New. How long have you been in the Army?

Maj. REINHART. Thirteen year.

Senator New. Are you a graduate of the academy?

Maj. REINHART. No, sir.

Senator New. How long have you been connected with the Aviation Service?

Maj. REINHART. Since December 12, 1916.

Senator New. You are a practical flyer?

Maj. REINHART. Yes, sir.

Senator New. I believe you came down yesterday from Mineola by airplane?

Maj. REINHART. Yes, sir.

Senator New. And are going back by that means as soon as you have testified here? Is that correct?

Maj. REINHART. Yes, sir.

Senator New. Major, with what machines have you had practical experience since you have been in the service? Describe the list as nearly as possible.

Maj. REINHART. I have flown the Curtiss J N 4A, J N 4B, and J N 4D, probably all three 500 hours. I have flown the L. W. F., the Standard, the Martin T T, all landing machines. I have flown the D H 4, the Thomas-Morse scouts, equipped both with the Gnome and the Le Rhone engines. I have also flown seaplanes.

Senator New. The committee desires to question you at this time more particularly in reference to the De Haviland 4. What particular opportunity have you had to observe this machine?

Maj. REINHART. When the DH 4's were first made in this country for over-sea service, eight of these were diverted. About 70, I am informed, had been made at that time and shipped to France. Eight were diverted to my station at Mineola, Long Island, to be used in connection with the aerial defense of New York.

Senator NEW. You tested them out there, did you?

Maj. REINHART. These machines were lined up and tested by me there in this service.

Senator NEW. What kind of tests?

Maj. REINHART. They were lined up and put in commission on a flying status. They were equipped with machine guns and bombs, and were used for, or attempted to be used for a certain number of hours,—two or three hours—in patrol work over New York City and over Long Island and the Jersey coast and the Sound.

Senator REED. Giving them a test somewhat similar to that which they would be put through on the front?

Maj. REINHART. As far as I am able to say, it would be the same test.

Senator REED. That is, you mean in the patrol work.

Maj. REINHART. In the patrol work.

Senator REED. Of course, it would be a test where you would not be pestered with any enemy machines, but you were trying to cover about the same tests as over there?

Maj. REINHART. Of course, you would not have had an enemy diving, etc., over you.

Senator REED. You put it through other tests, did you not?

Maj. REINHART. We gave it an official flight and tested its climb and speed.

Senator NEW. What was the general result of that test? I mean its result in regard to the De Haviland 4 machine?

Maj. REINHART. It revealed certain defects in the mechanical construction of the machine which made the machine for the purpose of patrolling at regular hours, or when the machine was actually needed, unsatisfactory on account of its unreliability.

Senator NEW. You say these were structural defects?

Maj. REINHART. Yes, sir.

Senator NEW. That were thus revealed?

Maj. REINHART. Yes, sir.

Senator NEW. Can you enumerate some of them?

Maj. REINHART. On the first eight machines the radiators sprung leaks and went out of commission after the first two hours' flight, on the average.

Senator REED. That happened to every machine you had in service?

Maj. REINHART. Yes, sir; as far as I know. I think I can safely state that every machine—it was reported to me that every machine after two hours' flight the radiators went out of commission, and I personally saw at least five radiators being taken off; but I did not inspect every machine. The landing gears were weak and the machines had to be reinforced in our repair depot before they were put into service.

Senator REED. Did you discover that before you started to use them?

Maj. REINHART. No, sir. One machine broke while being lined up on a concrete floor in a hangar from its own weight. Two machines

nosed over in attempting to get them out of the airdrome. The landing gears were then examined and it was found that the little braces above the axle or trunnion around which is wound the shock absorber were hollow and of very thin metal construction, and on examining different machines it was found the thickness of these trunnions was variable, so on some it was bigger than on others, so this trunnion had to be reinforced before the machines were safe to fly.

Senator NEW. Is there anything else of which you think now?

Maj. REINHART. Nothing else on these machines was revealed at that time except from examination of the machine, as a practical flyer, there were certain structural defects on them which, in my opinion, made them unsafe to fly. I mean I felt uneasy flying them myself.

Senator REED. What were those defects?

Maj. REINHART. The stabilizer was not fastened securely enough to the fuselage. It being an adjustable stabilizer, operated from the pilot's seat, only the support that it had in front from the connection to these controls was all that it was fastened to in order to hold it to the fuselage, so that when the stabilizer was shaken or tested out before flight it appeared to be very loose and very loosely fitted to the fuselage.

Senator REED. A bad piece of work, in other words?

Maj. REINHART. Yes, sir; not enough security to the fuselage.

Senator REED. Not enough strength.

Senator NEW. Did that make the machine dangerous?

Maj. REINHART. In my opinion it made the machine dangerous if you got into a bad position in the air. For instance, a steep nose dive, or if a bad wind turned you over, coming out of this the stabilizer is very liable, in my opinion, to come off while the ship is in flight.

Senator NEW. Should the stabilizer come off what would be the inevitable result?

Maj. REINHART. Fatal. The elevator controls the stabilizer, it being the most vital of all the controls.

Senator NEW. Major, have you since had further opportunities to observe this machine?

Maj. REINHART. I have.

Senator NEW. If there were any further defects that came to your notice, will you please state them?

Maj. REINHART. After a very few hours' flight—six hours average—on these eight machines, I personally examined these eight machines and found that the canvas had come loose from the wing structure, the ribs, and spars and wing beams. I first noticed this by its flapping on the ship while it was in flight, and in examining other machines afterwards I found that the canvas near the fuselage on the bottom of the lower wings had come loose and sagged out from 1 to 3 inches. The canvas on the upper wings near the center section had also come loose on the balance and sagged out to the same extent. On all ships—there were about five of these eight we found in this condition and they were put out of commission until the canvas could be replaced on the wings by our repair shop.

Senator NEW. Just how serious a matter was this loosening of the canvas on the wings?

Maj. REINHART. It would allow the canvas to sag while in flight, and probably puncture the fabric, in which case with a heavy load

like the De Haviland carries it would rip the fabric from the wings; the speed of the machine and the weight would rip the fabric from the wing immediately.

Senator NEW. What would be the result?

Maj. REINHART. Causing you to lose the lift or the effect of one wing, and put you probably into a spin and a crash. It might not happen, but it is certainly unsafe to take a chance in flying.

Senator NEW. You do regard it as highly dangerous?

Maj. REINHART. Absolutely. I do not believe any flyer would care to fly these machines with the canvas loose on the wings.

Senator NEW. Is there anything else which was revealed at that particular time which you think of now?

Maj. REINHART. Nothing else, sir.

Senator NEW. Then, I will ask you if you have had any subsequent experience with other machines of the same type?

Maj. REINHART. I have.

Senator NEW. Will you please state what that was?

Maj. REINHART. About 30 additional machines have since been sent to our field.

Senator NEW. That is, De Haviland 4's?

Maj. REINHART. Yes, sir. In the assembly of these ships, and during their first few flights, the flying wires and landing wires supporting the wings were found to be in very poor condition, necessitating the replacing of these wires, and the ships were put out of commission for that time.

Senator REED. Did you discover those on an inspection?

Maj. REINHART. Before each flight a qualified man inspects every ship, and the pilot who flies the ship also inspects it before every flight.

Senator REED. If you could discover this defect by an inspection after the machine came to your field, of course the defect could have been discovered by a proper inspection before the machine left the factory, could it not?

Maj. REINHART. Well, this particular defect, no sir. If the workmanship itself was not discovered to be faulty, the defect occurred after the ship had been put into flight. The defect was this: That the flying wires and landing wires where they support the wings and connect between the struts, they connect to safety devices and to the turnbuckles, and the wire itself is brought to the turnbuckle over a metal thimble and bent back, and a fine copper wire is then wound around the bent end to the extent of about 2 or 3 inches. Then it is soldered over so as to make it solid. After the first two or three flights this solder and these wires pulled out and broke away. It was wound up close together and the threads split away, and in one instance I saw the wire completely pulled out, so the whole wing gave way.

Senator REED. Then, this was a defect in construction that was revealed under the tension and strains of flight.

Maj. REINHART. Yes. Apparently, when the wires were put on, to the eye they were very well done.

Senator REED. What proportion of your machines did this weakness develop in?

Maj. REINHART. We had about 20 lines up when I left, and in practically every machine.

Senator REED. If it was true of those 20, and if they were not constructed as other machines had been constructed, a proper inspection would have developed it, would it not?

Maj. REINHART. I should think so, if they inspected at the time this work was being done.

Senator REED. That is what I am talking about.

Maj. REINHART. Yes.

Senator REED. So, if they were different from the other machines, that would have been discovered by a proper inspection. Now, if they were like the other machines, then a proper test of the other machines would have revealed a defect and weakness in that construction, would it not?

Maj. REINHART. Yes, sir.

Senator REED. So that it must follow that either this bunch of machines which were sent to you was in some way different from the ordinary machine, or else these defects which you found shortly after you got the machines were known or ought to have been known to the factory before the machine ever started out? That pretty nearly follows as an inevitable consequence, does it not?

Maj. REINHART. Yes.

Senator REED. How soon would these defects develop after you put the machine in flight? How many hours of flight did it require to develop that?

Maj. REINHART. Two or three hours. In some machines, I believe, after a flight or two.

Senator REED. A short flight?

Maj. REINHART. Yes, sir. May I state further? When these wires began to give away my engineer officer took them to the shops and put these wires under test, and every wire that was put under test—he took them right off the machines which were still lined up—they went slightly over the required test for the Government construction, which is a straight tension test. Then we tried taking them and beating them with a hammer at the time to cause the vibration that the machine has in flight, to see if that caused the giving away, but as to the result of that test I have not heard yet.

Senator REED. But the machine is supposed—this type of machine is supposed to be thoroughly tested in the air before these machines were sent out, and any weaknesses which developed in your case in all these machines should have developed in the other tests which were made at the shops; that is true, is it not?

Maj. REINHART. Yes, sir.

Senator REED. As a matter of fact, are not those wires, regardless of what the Government rule may be—is it not manifest that those wires are too weak and that the rule ought to be changed, if the rule is such that the wires conform to it?

Maj. REINHART. The wires are not strong enough to support the machine in flight.

Senator REED. Regardless of any rule, that fact having been developed, these wires must be strengthened, even if you have to change an Army rule?

Maj. REINHART. Yes, sir; they must be before the ships are safe to fly.

Senator NEW. Have you now enumerated all the structural defects of the machines which occur to your mind?

Maj. REINHART. Do you ask me for my opinion as to the construction of the machine?

Senator NEW. No; I was going to ask your opinion later. I am speaking now of the structural defects which have been clearly revealed by actual test and experience?

Maj. REINHART. Those are the only parts that gave way under flying tests.

Senator NEW. But the giving away of any of those parts would have resulted fatally to the pilot and in the wreck of the machine, would they not?

Maj. REINHART. Yes, sir; more in favor of it than not. Except in the landing. Now, if the landing gear gave away, the machine would be wrecked certainly, but the pilot might not be killed.

Senator NEW. But the machine' certainly would have been wrecked?

Maj. REINHART. Yes, sir.

Senator NEW. I will ask you to state your opinion as an expert flyer, based also upon your experience with the machine, as to the De Haviland 4.

Maj. REINHART. I believe that the De Haviland 4 as it is at the present time constructed is not strong enough to stand service tests, for the reasons that I have before enumerated, and, additionally, the weight of the wings supported by the nose wires from the front part of the longeron under the engine puts too much stress or strain on the front part of the fuselage. In a steep dive or under heavy strain that is liable to give away. The elevator control has only a metal fitting about 8 or 10 inches long on the front part, to which are attached the elevator and control wires. That is the only connection the elevator has with the control wires. This construction is too weak, in my opinion, to stand hard service. Additional support is necessary.

Senator NEW. Have you made any reports to the department of these observations of yours?

Maj. REINHART. I have made reports of defects as they occurred through the proper channels in Washington.

Senator NEW. Do you know what action, if any, has been taken on them?

Maj. REINHART. I do not. I have been told, though not officially, that the radiators had been strengthened and that the ships now coming out would have the fabric attached to the wings in a more secure manner.

Senator REED. Since you have spoken of the new machines, will you tell us when it was that you received the eight machines that you first described and then when it was that you received and tested the 30 machines, approximately?

Maj. REINHART. About the 1st of June we received the 8 and about the 15th of July we received 32, to the best of my recollection.

Senator REED. Do these defects which you spoke of as having been developed by the trying out of the 32 machines—did the wires show these weaknesses in all of these machines which were tried out in the air?

Maj. REINHART. I did not personally inspect every machine.

Senator REED. You were in charge?

Maj. REINHART. Yes, sir.

Senator REED. You can state your own observation and the reports which were made by the proper officers.

Maj. REINHART. I inspected some of the machines personally and my officers reported to me that there were only about eight machines that they would send in the air—one of my flying officers—on account of those defects.

Senator REED. Only about 8 of the 32?

Maj. REINHART. About 8 of the 20 we had lined up. The others have not yet been flown at all.

Senator REED. When you say "lined up," what do you mean?

Maj. REINHART. Assembled and ready to fly.

Senator REED. And there have been only 20 assembled?

Maj. REINHART. Yes, sir.

Senator REED. And the others have not been assembled?

Maj. REINHART. Yes, sir.

Senator REED. And your officer feels that he can not take any chance on flying the others?

Maj. REINHART. Yes, sir.

Senator NEW. Only the eight?

Maj. REINHART. Yes, sir. And I do not think I will fly those any more.

Senator REED. The eight?

Maj. REINHART. Yes, sir.

Senator REED. And you will not fly them any more because you do not consider them safe?

Maj. REINHART. That is it.

Senator REED. You do not want to order a man to fly a machine that you would not care to fly yourself?

Maj. REINHART. I would not order a man to fly in a machine I would not fly in myself.

Senator NEW. Major, will you please tell us just what type of plane the De Haviland 4 is supposed to be?

Maj. REINHART. My understanding is that the De Haviland plane is to be used for a bombing plane, for a double-seater fighting machine.

Senator NEW. Do you think, with your experience and with your observation of it, that it is fitted for either of those purposes?

Maj. REINHART. I believe that it could be used for either of those purposes, though, in my opinion, it is not as good a machine for either purpose as a straight scout or straight double-seater fighter, or straight bombing plane. I believe that in bombing with this plane against enemy machines that I have read about you would do it at a disadvantage.

Senator REED. When you say it can be used, you mean that it can be used in the absence of better machines.

Maj. REINHART. Yes, sir.

Senator REED. Just like a lumber wagon could be used on the race track in lieu of a sulky if you had no sulky and had to have something; is that the idea?

Maj. REINHART. Yes, sir.

Senator REED. You think that two men who went up in a De Haviland 4 and had to do battle in the air with a German machine would be at a disadvantage?

Maj. REINHART. Yes, sir; most decidedly.

Senator NEW. Then, Major, would you recommend the continued use of the De Haviland for either of those purposes, either as a bomb dropper or as a fighter?

Maj. REINHART. I have never been abroad to see conditions on the other side, but from what I have learned by reading and talking to officers who have come back from the front, I believe that a better machine for both purposes could be built.

Senator NEW. I think that is all, Major. We are very much obliged to you for your attendance.

STATEMENT OF CAPT. J. H. KELLEY.

Senator NEW. Will you please state your name, rank, and present Army detail?

Capt. KELLEY. John Hubert Kelley, captain Signal Corps Reserve, at present in charge of what we call the fighter flight, including the De Haviland 4's at the testing department, Wilbur Wright field, Fairfield, Ohio.

Senator NEW. How long have you been in the Aviation Service, Captain?

Capt. KELLEY. I went with the R. F. C. in 1915. I am honorary captain in the royal air force at present. I have been with the British a little over two years, and left the British to accept a commission in the United States Air Service January 7, 1918. I returned from overseas July 4, 1918.

Senator NEW. You have had actual experience on the front?

Capt. KELLEY. Yes, sir; quite a number of hours over the lines in British machines, and in battle with some in 1916; also in the Home Defense in London, and I have trained every type of pilot in the British Army; that is, I have had charge of a great number of pilots, and as high as 54 machines. The list is given on this slip of paper.

Training machines.—Maurice Farman long horn F, Maurice Farman short horn F, Curtiss A, Henri Farman F, Avro Gnome E, Avro Mono E.

Service machines.—BE2C, BE2D, BE2E, BE12, FE2B, Vickers Fighter, Bristol Scout, Sopwith Pup, DH No. 1, DH No. 2, DH4 English, Breguet (French), Nieuport.

They are practically all British machines, except the last two, which are Farnams. The Breguet is a two-seated fighting and bombing machine of the French.

Senator REED. You say nearly all these machines are English. Will you indicate the names of those that are French?

Capt. KELLEY. The Maurice Farman long horn and short horn are French, and the Henri Farman is French, and the Curtiss, of course, is American, both Gnome and Mono are English, and all these other machines are English except the Breguet and the Nieuport, which are French.

Senator NEW. Captain, what experience have you had with the De Haviland 4 as built in England?

Capt. KELLEY. The De Haviland 4 is built in England with the A. I. D., that is, the aeronautic inspection department has to my knowledge also proven satisfactory.

Senator NEW. What do they use it for?

Capt. KELLEY. As far as I know it has been used for long or photographic reconnoissance over the lines, and has been used some as a bomber.

Senator REED. But principally for reconnoissance work?

Capt. KELLEY. As far as I know. They have quite a number of those squadrons on the front and it is pretty hard to say.

Senator REED. You spoke of this inspection department.

Capt. KELLEY. The aeronautic inspection department in the R. F. C. Before any part of a machine is allowed to be put into a machine it has to be examined by the aeronautic inspection department. If a machine is crashed on an airdome after it is assembled, before that machine can be put into the air again it has to be inspected by an A. I. D. inspector, which is the short way of saying it.

Senator REED. In other words, I take it you mean to tell us, Captain, they have a very thorough inspection by real experts?

Capt. KELLEY. Absolutely. Probably as thorough as it is possible to make it, by men who understand what they are doing, and they are the last word. If the A. I. D. say the machine is unsafe to fly a pilot will practically be court-martialed if he takes that machine up.

Senator REED. What opportunity have you had to observe the D. H. as built in this country, and how does it compare with the British machine of the same type?

Capt. KELLEY. The answer to the first part of that is: I arrived for duty July 15 at Wilbur Wright field and inspected for my satisfaction the American-built De Haviland 4's. After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion the machine is not safe to fly. I mean to fly. I mean to say it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

Senator REED. What are the principal differences between the English De Haviland and the American De Haviland, aside from the mere manner of workmanship?

Capt. KELLEY. That I could not say, because the De Haviland 4 when it was first gotten out had a 220-horsepower Rolls Royce engine in it. The conditions which would exist with a 400-horsepower Liberty would, of course, be quite different, so I do not care to express an opinion. I do not know what they are making over there now, understand.

Senator REED. I am speaking about the English De Haviland that you spoke of which has a 220-horsepower motor?

Capt. KELLEY. That was the only one which I was familiar with at all, and I was familiar with that particular machine only from a little personal experience and only from what other people had said about it.

Senator REED. But the machine you knew had a 220-horsepower Rolls Royce engine?

Capt. KELLEY. Yes; it has since been changed. I think it is a 360 now

Senator REED. And you do not know just what changes have been made in it to strengthen it in order to correspond with the increased power and weight of the larger Rolls Royce engine?

Capt. KELLEY. No, sir; I do not.

Senator REED. But how does the general structure of the American De Haviland, into which we have put those heavy Liberty motors, correspond with the De Haviland which you were familiar with that carried the 220-horsepower Rolls Royce? I mean to say, has it been materially strengthened, in your judgement, or is it weak in the American machine?

Capt. KELLEY. The way they make them over here, or the way the American-made De Haviland 4—in the first place, the fabric—whether it is the paint which is put on after it is doped—but every fabric that I tested on a wing would not be allowed to be flown, as far as I am concerned. I would condemn it because it is dead. The fabric must sound like a drum. If it leaves an impression of your finger when you put your finger on it and slowly comes back again, that fabric would be condemned and taken off and new fabric put on until it stretched tight.

Senator REED. That is very essential.

Capt. KELLEY. Absolutely; the most important part of the flying machine. That is what you have to keep you in the air. If the fabric bags as you bank up it will finally split and, of course, if the fabric splits you come down and it is all over.

Senator REED. Did you notice other structural defects?

Capt. KELLEY. The tail plane on its leading edge is spliced. You can take hold of the outside of the tail plane and show a play of at least an inch from where it is spliced to the edge. It is spliced about a foot away from the edge. Where the tail plane is attached to the fuselage there is a very decided play. It must be one-eighth of an inch, so that when the machine is in flight there would be constantly a vibration on that which you must get away from.

Senator REED. That would rock your whole machine and make it unsteady and uncertain in the air?

Capt. KELLEY. Not necessarily that, but it would eventually crystallize everything around there and cause it to fall off; and if the machine is put in a bad position, as they often are, the chances are it would break off. In other words, it is not considered safe construction. Where the tail plane is attached to the fuselage on its leading edge are two small wires. The late construction on all heavy machines, and on some light machines, is a metal tube going from the leading edge to your fuselage, making that tail plane solid, as it should be. The aileron, rudder, and elevator fittings have a hinge only on one side, so that the strength of that is only in the cotter pin. A cotter pin is made to lock a bolt and not to take any strain. [Referring to a diagram.] Here is a spar, and there is a bolt through that spar with a hinge on it. The best design is a hinge on this side and on this side, and with the De Haviland as now made the hinge is only on one side. The bolt goes through there, and that is only held in place by a cotter pin, so if you push on that you might get a bolt along there that gave that a side play, and it would tear this out. You can tear those cotter pins out by hand.

Now, that is all in regard to the tail plane. Now, where the main spars are attached to the fuselage, they are held in place by a very light bolt. On inspecting a machine that had done about 60 hours' flying I found that both front bolts had been bent and all eight holes had been enlarged by the constant vibration until there was a play

in each hole of at least a quarter of an inch; one of them was about half an inch.

Senator REED. Those holes go through what?

Capt. KELLEY. Through the wood. There are four spars on each side, and they take the strain of the wings. The fitting from the fuselage onto these main spars is too short. None of these holes are metal bushed, so that the least play or vibration allows the bolts to chew into the wood, enlarging the hole, and making the machine very dangerous.

Senator NEW. Captain, let us be a little more specific about the danger that would result from the loosening of this bolt hole. Just expand on that a little, will you?

Capt. KELLEY. By these holes becoming enlarged and bending the bolts in ordinary maneuvers the wing is very liable to drop off, which, of course, would kill whoever was in the machine.

Senator NEW. When the wing is off the machine is done.

Capt. KELLEY. Yes; and so are the poor devils who are in it.

Senator NEW. Which is more important. You may proceed, Captain.

Capt. KELLEY. The cables are wrapped and soldered, which is not the accepted European way. All your European cables that I have personally had experience with are spliced. The difference in the two ways is this: By splicing your cable you have in plain view at all times every strand and can see any breakage. By the wrapping and soldering method it is impossible to tell from the outside whether that has been properly soldered on the inside, and my opinion is that it is an unsafe way of attaching cables on an airplane. The three-ply wood which is used on the fuselage on all machines that I looked at had been very badly warped. The splicing of the longerons half-way back on the fuselage seems to me to be a bad design. The inspection of machines that were turned over to us looks very much as if there had not been any. I found one main spar which had a hole drilled through it in the wrong place, and instead of throwing it away they drilled a hole slightly below it running the two holes together. This machine was put together in that condition and sent to us as a serviceable machine.

Senator NEW. What did you do with the machine?

Capt. KELLEY. We took photographs of it, and could not use it.

Senator REED. What would be the effect of those holes in the wood?

Capt. KELLEY. The effect would be that the wings would fall off in the air after 3 to 10 hours, depending upon the strain which would allow that to give. It might be flown for five hours and that particular strain not be put on it.

Senator REED. But that machine was delivered for service?

Capt. KELLEY. Yes, sir. Another main spar had a knot in the center between two bays. I have never seen wood used in an airplane that had knots in it before. The way the drift wires are attached to the longerons is very weak and would on a dive allow those fittings to pull out and detach your wings from the airplane, killing whoever was in it. The guns as at present mounted for the pilot are absolutely inaccessible. The sights placed on one side, of course, is absurd. In other words, in pointing your machine, which is the only way the pilot can sight his guns, the pilot has to lean over this way, and when you have a bead on your enemy machine you have to sit

still. If you lean to one side to sight your gun you automatically would move your hand on your control, and that would throw you out of line on the machine you are aiming at. In the position your guns are at it would be impossible to clear any jams that may occur without standing up on the seat.

Senator REED. Any jam in the gun?

Capt. KELLEY. Any jam in the mechanism of the gun itself or in the cartridges. Then, the distance between the pilot and the observer is so great that there is no way that they can communicate. If that is to be carried out on any type of machine each machine should be fitted with a telephone. It is very necessary that they should be able to speak to each other because the pilot watches the front and the observer watches the back and the observer, if he saw a Hun coming could not tell the pilot. The ribs and the wings are very weak and not close enough together in the first bay, where the air from the propeller goes through allowing a vibration and loosening of the fabric. On each machine that I have had in my charge I have had to re sew the fabric on all of them, as it was very badly done. One wing which I inspected had the fabric sewed only in one place, which might cause that fabric to become loosened and of course crash the machine. The leading edge of the wings is not three-ply wood from the leading edge to the main spar, which construction gives you a bad wing curve, and you lose efficiency. It also is liable to cause the fabric to start to rip and continue down the cord of the wing. I think that just about covers it.

Senator REED. You will have a chance to read the transcript of this testimony and make any corrections or additions you may care to.

Capt. KELLEY. I want to say one thing about the engines. The carbureters being placed in the V is not considered, in my opinion, a safe place. If a back fire occurs it will set fire to your machine, and a back fire is liable to occur at any time. The carbureter should be on the outside and dropped down below the engine.

Senator REED. In its present condition, by which I mean in the condition in which you have found the De Haviland 4, do you regard it as a proper machine to fly?

Capt. KELLEY. The best way I can answer that is that personally I would not send anyone up in it, and I would not fly it myself.

Senator REED. You regard it as unsafe?

Capt. KELLEY. Absolutely.

Senator REED. Assuming that these parts were strengthened, so that you could eliminate the elements of danger incident to this bad construction and bad inspection, for what purposes could this machine then be practically adapted, and when I say that, I mean to be adapted so that it would be a competent machine for service on the front, if it is competent for any purpose.

Capt. KELLEY. If the machine was properly strengthened, I think it could be used for photographic reconnaissance.

Senator REED. Do you believe that the De Haviland 4 can be changed and the defects which you have mentioned eliminated, so that it will become a practical machine for service upon the front as a photographic reconnaissance machine? Do you believe that can be done?

Capt. KELLEY. Yes, sir.

Senator REED. Even with the machines which have already been built?

Capt. KELLEY. Yes, sir.

Senator REED. It would, however, require taking them back to the shop.

Capt. KELLEY. Most of those changes could be done in the average airdrome.

Senator REED. When that is all done, however, you have not got a fighting machine, as we call it?

Capt. KELLEY. Absolutely not.

Senator REED. Men using that machine on the front and being attacked by the enemy would find themselves at a disadvantage. Is that what you meant to say?

Capt. KELLEY. Yes, sir.

Senator REED. And the flyer would be liable to lose his life or be captured, but he might get away or capture the other man if he had as good a machine as the other man?

Capt. KELLEY. If he was using a photographic machine.

Senator REED. I am speaking about using it as a fighter.

Capt. KELLEY. I do not think it is fit for that.

Senator REED. What are good types of fighting machines which have been thoroughly tested and tried out?

Capt. KELLEY. The Bristol fighter as the English make it, with the Rolls-Royce engine, has been very successful. The French two-seated Briguet has been quite successful. In fact, they all want them at the front.

Senator REED. What type of engine is it?

Capt. KELLEY. 220 Renault.

Senator REED. How is the Spad?

Capt. KELLEY. It is a single-seated machine, and it is very good, and everybody is very keen about it.

Senator REED. Are you familiar with the two-seated Spad?

Capt. KELLEY. No.

Senator REED. Are you familiar with the S. E. 5?

Capt. KELLEY. Yes, sir; I was in the first squadron that had them.

Senator REED. What is your opinion of that machine?

Capt. KELLEY. I think it is a very good machine. The results at the front have been splendid, but it is a scout machine and will not go far from the lines.

Senator REED. Has it as much range as the Spad?

Capt. KELLEY. That I would not care to state, because I do not know enough about the Spad personally. These other two officers here will be able to tell you more about that, because they have had a good deal of Spad work.

Senator REED. Returning to the De Haviland machine, what about its climbing qualities and its range of flight?

Capt. KELLEY. The general opinion is that the climb of the De Haviland 4 is very good, but with the war load and the Liberty engine, as at present made, it will not stay up for its full time.

Senator REED. That is, the flight is very short?

Capt. KELLEY. It is very short, and it has to come down again. The chances are that if you got over the lines you would just get started over there and would have to land in Germany.

Senator REED. In your opinion, are we sufficiently careful? Would not a large number of these defects which you have spoken of be eliminated if we used more care and time and were not so keen to produce great quantities of airplanes?

Capt. KELLEY. My experience with American mechanics is that they are in too great a hurry to finish whatever job they are on instead of trying to make that job as perfect as they could make it if they took more time.

Senator REED. In other words, the thing we have struggled for in this country largely is quantity more than absolute accuracy?

Capt. KELLEY. The airplane is practically a hand-made machine. Certain parts of it can be turned out by machinery, but the greatest care and exactness must be used in the selection not only of the material but the way in which the work is carried on and in the final assembly. I can put it this way: This is a phrase that I used to use in talking to mechanics: An airplane, in my judgment, every time it is wheeled out of its shed to go in the air must be in the same condition that a race-car driver expects of his machine on any big race that he enters.

Senator NEW. Captain, when did you leave France?

Capt. KELLEY. I sailed from Brest June 27.

Senator NEW. Up to the time you left France, had you seen an American combat plane in used over there?

Capt. KELLEY. No, sir.

Senator NEW. Were there any in use to your knowledge?

Capt. KELLEY. To my knowledge there were none in use. Had there been I would have heard about it.

Senator NEW. You say, then, that there was not an American combat plane in use in France?

Capt. KELLEY. On the front?

Senator NEW. On the front, that is.

Capt. KELLEY. Yes, sir.

Senator NEW. As late as the 27th day of June, is that correct?

Capt. KELLEY. That is correct. About June 22 or 23, when I was in Paris, I met a pilot who had flown the American-built DH-4. What his name is, I can not remember. I asked him his opinion of the machine and he told me it was the poorest job he had ever seen on an airplane, and that he did not like to fly it at all, and would not fly it unless he was ordered to do so.

Senator NEW. In your opinion, Capt. Kelley, what machine or machines would be best adapted for the purposes for which the De Haviland 4 is intended? In other words, if that is, for any reason, to go into the discard, what ought we to build to take its place?

Senator REED. Let me suggest there this question: Is there any machine that will successfully perform all of the things that it has been claimed the De Haviland is made to perform; that is, the functions of a fighting machine, a bombing machine, and a reconnoissance machine?

Capt. KELLEY. No, sir. So far as I know, I can not find out what the De H. is to be used for, so far as the American Army is concerned; but such a combination as a reconnoissance, bombing, and fighting machine—by that, I mean carrying a load of bombs sufficient to go over and do some damage—I do not mean 50 or 60 or 100 pounds of bombs, but enough to do some damage—I do not know of

such a machine at all. The Breguet make a fighting machine similar to their bombing machine, but they do not send the bombing machine up to do fighting work, because the bomb racks add so much weight to the machine that they slow it up considerably.

Senator New. That is all, Captain.

(Whereupon, at 12.15 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same date.)

AFTER RECESS.

STATEMENT OF CAPT. CHARLES C. JOHNSON.

Senator New. Captain, state your name and rank?

Capt. JOHNSON. Charles C. Johnson.

Senator New. And what is your age?

Capt. JOHNSON. Twenty-eight.

Senator New. And your rank?

Capt. JOHNSON. Captain, Wilbur Wright Aviation Field, Fairfield, Ohio. I am officer in charge of scout flight, testing department.

Senator New. How long have you been in the Army, Captain?

Capt. JOHNSON. Since May 25, 1918.

Senator New. Did you enter from civil life?

Capt. JOHNSON. No, sir; from the French Army.

Senator New. From the French Army?

Capt. JOHNSON. Yes, sir.

Senator New. You were transferred to the American Expeditionary Forces from the French?

Capt. JOHNSON. Yes, sir; in France I was transferred.

Senator New. In France?

Capt. JOHNSON. Yes, sir.

Senator New. How did you happen to join the French forces?

Capt. JOHNSON. Well, I——

Senator New (interposing). I will change that question. When did you join the French forces?

Capt. JOHNSON. 1915.

Senator New. In what capacity?

Capt. JOHNSON. As a soldier in the infantry.

Senator New. Were you afterwards transferred to the aircraft forces?

Capt. JOHNSON. I was transferred to the aircraft forces at the end of 1915, and became a pilot in 1916—January 2, 1916.

Senator New. How long did your services with the French aviation forces continue?

Capt. JOHNSON. Until May 25, 1918.

Senator New. And how did they terminate?

Capt. JOHNSON. By transfer to the American Army.

Senator New. That was the date of your transfer to the American Army?

Capt. JOHNSON. Yes, sir.

Senator New. You say you were a pilot in France?

Capt. JOHNSON. Yes, sir.

Senator New. Did you participate actively in any of the engagements with the French forces?

Capt. JOHNSON. Yes, sir.

Senator NEW. Where did you serve? Five us a brief outline of your service with them.

Capt. JOHNSON. I served at Verdun; that is, in the offensive of 1916; Alsace; the battle of the Somme; Chemin-de-Dames; Flanders. Well, I have repeated up and down the line. There is no use going over any more, is there, sir?

Senator NEW. No; that is quite sufficient. What machines did you fly while with the French.

Capt. JOHNSON. The Bleriot, the Vosin, Sopwith, Caudron, G-3. Morane-Parasol, Morane 110 horsepower; Rhone-Monocoque, Nieuport type, 23-meter, type 18-meter Nieuport; type 15-meter Nieuport; type 13-meter Nieuport, and the Spad.

Senator NEW. How do you regard the Spad?

Capt. JOHNSON. As a very excellent machine.

Senator NEW. It is a single-seater fighter?

Capt. JOHNSON. Yes; there is a single-seater and a two-seater fighter.

Senator NEW. Are you at all familiar with the De Haviland 4, as it is made in England?

Capt. JOHNSON. Very slightly. At Dunkirk last summer there was a squadron of the Royal Naval Air Service of De H. 4's there—machines all built in England.

Senator NEW. What opportunity have you had to observe the De H. 4 as made in the United States?

Capt. JOHNSON. Very little.

Senator NEW. Where was that?

Capt. JOHNSON. At Wilbur Wright Field, Fairfield, Ohio.

Senator NEW. How long have you been stationed at the Wilbur Wright Field?

Capt. JOHNSON. Since the 17th of July, 1918.

Senator NEW. Since you have been there, have you had any opportunity to examine the D. H. 4 and to form an opinion concerning its merits as an air machine?

Capt. JOHNSON. Well, really very little because, you see, my department is the scouts, and that does not come under my jurisdiction at all, but I have looked into the matter slightly. I have seen some of the weak points.

Senator NEW. You think it has weak points, then?

Capt. JOHNSON. Yes, sir; from never having flown it; from simply inspection on the ground.

Senator NEW. Will you tell us what you think some of those weak points are?

Capt. JOHNSON. Well, the first is the fabric on the wings. The fabric on the wings is apparently dead, due, I think, to the paint which is put over the dope.

Senator NEW. You say "dead"?

Capt. JOHNSON. Yes.

Senator NEW. Just what do you mean by that?

Capt. JOHNSON. It has no life in it. A good canvass, if you hit it with the finger, it sounds more or less like a drum. On the D. H. 4's that I have seen, if you should put your finger on the fabric, it gives and the imprint of your finger stays there. It does not come out the way it should. It is not firm.

Senator New. What does that indicate?

Capt. JOHNSON. It indicates that the fabric has no life.

Senator New. Do you think that is due to the material used, or to the manner in which it is put on?

Capt. JOHNSON. In my estimation it is due either to the dope or the paint. The material that I have seen untouched on the D H 4 is good, but after the dope or paint is on there, it seems to be dead.

Senator New. What, in your judgment, would be the effect of that on the machine in the air?

Capt. JOHNSON. Well, if the machine were given any bad strains, such as you would have in actual combat, it would tend to split and tear off.

Senator New. With what result?

Capt. JOHNSON. With fatal result.

Senator New. Fatal to the aviator?

Capt. JOHNSON. Fatal to the occupant and fatal to the machine.

Senator New. And fatal to the machine?

Capt. JOHNSON. Yes.

Senator New. What other defects have you observed?

Capt. JOHNSON. I have observed the fittings of the main spars to the fuselage. The machine which I saw the wings being taken off of, the holes which held the bolts in the woodwork were considerably enlarged, and the bolts themselves bent. The enlargement of those holes was due to the fact that there was no bushing put in the holes, and that allowed the bolts to have a little play, gradually making the hole larger, from the vibration.

Senator New. Capt. Kelley testified to that same defect, I believe?

Capt. JOHNSON. Yes.

Senator New. Do you share his opinion that the working of the bolt, caused by the vibration, and tending to enlarge the holes so as to loosen the grip on the bolts, would be productive of a very damaging result?

Capt. JOHNSON. Yes, sir. If there were a strain—a certain strain I might say—put on that point, it would probably result in the wing tearing off, with fatal results to pilot, observer, and machine.

Senator New. Now, what might produce such a strain?

Capt. JOHNSON. Well, a dive; suddenly pulling out of a dive or throwing the machine over on that wing suddenly and taking a very quick and steep turn.

Senator New. Are not all of those maneuvers absolutely necessary in the manipulation of a machine in the air in combat?

Capt. JOHNSON. In combat they are.

Senator New. So that am I to understand that in your opinion this would render the machine liable to collapse as the result of any of those maneuvers during a combat?

Capt. JOHNSON. Yes, sir: it would.

Senator New. To just what extent, Captain, do you think that renders that machine unfit for use?

Capt. JOHNSON. I did not quite get that, sir.

Senator New. Just change the question, then. In your opinion, does this defect render the machine so liable to damage that it ought not to be used?

Capt. JOHNSON. Yes, sir; it does.

Senator New. Have you observed the construction of the stabilizer?

Capt. JOHNSON. In a casual way; yes. The bolts fitting on to the fuselage are too weak, and at certain points they are only held on by counter-pins, and the entire tail has a play both forward and backward and up and down which produces a certain amount of friction and causes a strain on those points, which weakens the tail.

Senator New. Have you ever flown the DH 4 out there?

Capt. JOHNSON. No, I have never flown a DH 4 at any place.

Senator New. You heard the evidence given by Capt. Kelley?

Capt. JOHNSON. Yes, sir.

Senator New. Do you indorse the opinion he has expressed of the De Haviland 4, from what you know of it?

Capt. JOHNSON. From the points that I have seen—and, of course. I have not looked over the machine as carefully as he has—but those points which he brought out, that I know of, I indorse absolutely.

Senator New. Then, is it your judgment that the machine is unsuited for use as a fighting machine?

Capt. JOHNSON. Yes, sir; in my estimation, from what I know of actual war fighting.

Senator New. I should think your opinion on that would be entitled to some little consideration now.

Capt. JOHNSON. It is absolutely unfit as a fighting machine.

Senator New. Would you care to use it yourself, for your own purposes in combat?

Capt. JOHNSON. I would not. There is one thing I would like to say, sir, if I may.

Senator New. You may. We want to get at the absolute truth concerning this machine, and in order that we may do that we have asked you gentlemen of wide experience to come here and tell us what you actually know and what you actually think of that machine from your own direct observation of it.

Capt. JOHNSON. It is a matter of cables. In all my experience over there I have never seen a machine where they used cables that those cables were not spliced instead of being bent over the eye and wrapped and then soldered. The reason that I disapprove of the wrapping and soldering method is that if it is done at all poorly, the solder does not soak through underneath, and then when it is wrapped you cover up a point where there is a great deal of strain on the cable and you can not see whether it is being worn or not, and then the outside covering with solder may or may not be uniform and have gone thoroughly through the wiring.

Senator New. And it is the wrapping and soldering method that is employed on the American De Haviland 4?

Capt. JOHNSON. Yes, sir; it is. You can not determine whether that is strong or not, with the naked eye.

Senator New. Well, in case that should give what would be the result?

Capt. JOHNSON. It all depends on the cable which gives. If it were on a flying cable, it would give and the wing would be liable to fly off.

Senator New. Are there any other defects to which your attention has been directed?

Capt. JOHNSON. No, sir.

Senator NEW. Then, if you will, I would like for you, in as brief a way as possible, to state to the committee your opinion of the DH 4 as a combat plane—whether it should be employed for that purpose by our forces.

Capt. JOHNSON. Well, in the first place, in my estimation the machine as it stands at present is not a safe machine to fly, and it certainly would not stand the strain of a combat, where one has to dive and whirl and put particularly severe strain on all points of a machine; then, in the second place, it is too large a machine; it does not maneuver quickly enough. That is about all I can say about it. It is too heavy to handle.

Senator NEW. Are we to understand, Captain, then, that you think these structural defects, of which you have spoken, are such that they can not be remedied to the extent of making the machine serviceable?

Capt. JOHNSON. Yes; I think they can be remedied, but never to be a combat machine.

Senator NEW. Just what do you mean by that? That they can be so remedied so as to make it serviceable for reconnaissance purposes?

Capt. JOHNSON. Reconnaissance purposes or photographic purposes.

Senator NEW. But not as a fighter?

Capt. JOHNSON. No.

Senator NEW. Nor as a day bomber?

Capt. JOHNSON. I can not say, because I have never had experience in daylight bombarding.

Senator NEW. As to that you merely do not know?

Capt. JOHNSON. I do not know.

Senator NEW. You do not express any opinion?

Capt. JOHNSON. No; I can not on that.

Senator NEW. I think that is all, Captain.

Capt. JOHNSON. May I just say one thing about the engine?

Senator NEW. Yes; you may add anything you please.

Capt. JOHNSON. The carbureters are placed in the V of the engine.

Senator NEW. You are speaking of the Liberty motor?

Capt. JOHNSON. Yes, of the Liberty motor; and if there is a back-fire—which is constantly occurring—there would be a great and almost sure chance; no, I would say there would be a great chance of the machine catching fire.

Senator NEW. What is the remedy for that?

Capt. JOHNSON. To put the carbureters down below, I should suggest.

Senator NEW. Outside of the V?

Capt. JOHNSON. Outside of the V.

Senator NEW. Has not that been done with the Liberty motors sent to the English?

Capt. JOHNSON. That I could not say. I have not seen one, but on all the DH4's I have seen out there, the carbureters have been in the middle of the V.

Senator NEW. Capt. Johnson, when did you say you left France?

Capt. JOHNSON. When did we sail from France, Frank?

Lieut. WELL. The 24th of June.

Capt. JOHNSON. The 24th of June, 1918.

Senator NEW. Previous to your leaving there, had you seen any American combat plane in use on the western front?

Capt. JOHNSON. No, sir.

Senator NEW. Do you know of any American combat planes having been used for combat purposes on the western front?

Capt. JOHNSON. No, sir.

Senator NEW. If any such had been used, do you think you would have heard of them?

Capt. JOHNSON. Yes, sir; I think so.

Senator NEW. That is all, Capt. Johnson.

STATEMENT OF MAJ. H. S. MARTIN—Continued.

Senator NEW. Maj. Martin, when you were before the committee a few days ago, you were asked to submit a table of performances for machines in use in 1919, and types recommended for production in the United States. I now show you a copy of such a table, which has come to the committee since your last appearance. Is this the table that you were asked to present [exhibiting paper to witness]?

Maj. MARTIN. Yes, sir.

Senator NEW. I notice here in next to the left-hand column, under the title, "Best existing types," that the De Haviland 4 is twice mentioned. Does that have reference to the De Haviland 4 as made in England or as made in the United States?

Maj. MARTIN. It refers to the English machines mainly, because our information on the De Haviland 4 as manufactured in the United States is very indefinite. At the time I was in France there were no American De Haviland 4's over there.

Senator NEW. The De Haviland 4, however, was not recommended by the board, of which you were a member, for production in the United States for service in 1919; is that correct?

Maj. MARTIN. It is not recommended for production in 1919.

Senator NEW. This sheet is entitled "Table of performances of machines for use in 1919, and types recommended for production in the United States."

I note, Major, that among the machines recommended for production in 1919 is the Bristol fighter, with 300 horsepower Hispano-Suiza motor. I have also noted that the Liberty 12 was recommended for use in this plan by Col. Clark. Will you explain to the committee the circumstances and the understanding under which that recommendation was made?

Maj. MARTIN. When the question came up as to what engine should be put into the Bristol fighter there really was only one engine available, and that was the Liberty 12. It had been definitely decided that the Liberty 8 would not be produced. Col. Clark was advised that the Liberty 12 would weigh 740 pounds, and a natural assumption would be that the weight of radiator, water, etc., would be the same as any other engine of like horsepower. One of the engines used in the Bristol fighter is the 190 Rolls-Royce, which weighs very nearly 700 pounds. It seemed quite reasonable, then, to assume that the Liberty 12 could be put in the Bristol fighter.

Senator NEW. At the weight reported, of 740 pounds?

Maj. MARTIN. Yes, sir. Actually, the Liberty engine weighs 825 pounds and is quite difficult to cool efficiently. In addition to this

everybody, apparently, was able to make suggestions as to improving the Bristol fighter, with the net result that the total weight of the machine was increased nearly 800 pounds. Col. Clark's original figures called for a total weight somewhat greater than 2,900 pounds, whereas the Bristol weighs 3,360 pounds, approximately.

Senator NEW. I will ask you, Major, if you will explain briefly the arrangement of this table which you have submitted and identified.

Maj. MARTIN. The board selected the nine types of machines which they thought would be used in 1919 and then listed the best existing types of those machines. Of two of those types no example exists at present, except experimentally. We then decided which of these existing types would be used in 1919; then which of those types it was desirable to produce in the United States in 1919. The table also includes the desired performances of machines which it is considered necessary to approximate in order to have machines which will be satisfactory for the different purposes. It should be understood that not all of the types which have been finally recommended for production in 1919 will give exactly the performance which are desired, but they will all approximate them very closely.

Senator NEW. I think that is all, Major.

STATEMENT OF LIEUT. FRANK W. WELLS.

Senator NEW. State your present rank and station.

Lieut. WELLS. First lieutenant, Aviation Section, Signal Reserve Corps, Wilbur Wright Field, Fairfield, Ohio.

Senator NEW. What are your present duties at the Wilbur Wright Field?

Lieut. WELLS. Pilot in the scout flight.

Senator NEW. Have you been connected with the air service of any of the allied forces?

Lieut. WELLS. Yes, sir.

Senator NEW. Before joining those of the United States?

Lieut. WELLS. Yes, sir.

Senator NEW. With which one?

Lieut. WELLS. The French Army.

Senator NEW. How long were you with the French Army, and in what capacity?

Lieut. WELLS. One year, as pilot.

Senator NEW. You saw active service on the French front, did you?

Lieut. WELLS. Yes, sir.

Senator NEW. Will you state where that service was just a little more definitely?

Lieut. WELLS. The front on the Verdun sector and the Champagne sector.

Senator NEW. When did you join the United States forces?

Lieut. WELLS. I got my active orders on the 1st of January.

Senator NEW. The 1st of January, 1918?

Lieut. WELLS. Yes, sir.

Senator NEW. By transfer?

Lieut. WELLS. Yes.

Senator NEW. Were you transferred directly from the French to the American forces?

Lieut. WELLS. Yes.

Senator NEW. When did you come to the United States?

Lieut. WELLS. On July 1, 1918.

Senator NEW. What were you doing with the American forces between the time you joined them and the time of your departure for the United States?

Lieut. WELLS. The first month or six weeks I was officer in charge of R. M. A. work in the second aviation instruction center in France. Then up until the time I left I was officer in charge of the field.

Senator NEW. With what air machines did you have experience, either with the French or American forces abroad?

Lieut. WELLS. With the Bleriot, Caudron, G-3, the Nieuport type 28, 23, 18, 15, 13. On the 15, there was 80, 110, and 120 horsepower. The Spad 140, 180, 200, and 220.

Senator NEW. What is your opinion of the Spad machine?

Lieut. WELLS. I think it is one of the best scout machines there is.

Senator NEW. What machines have you flown since you have been at the Wilbur Wright Field?

Lieut. WELLS. None at all.

Senator NEW. None?

Lieut. WELLS. No, sir.

Senator NEW. How does that happen?

Lieut. WELLS. There have not been any machines to fly in the scout flight, with the exception of one, and I did not think that was fit to fly, so I did not fly that one.

Senator NEW. What was that—what type of machine?

Lieut. WELLS. Standard M defense.

Senator NEW. Just why do you say that, Lieutenant, or on what is that opinion based?

Lieut. WELLS. On my experience with small machines in the French army. There are so many little things, that I did not consider it just the proper machine to fly and do stunts with.

Senator NEW. You thought it an unsafe machine; is that it?

Lieut. WELLS. Yes, sir.

Senator NEW. Well, that introduces a new figure. What seemed to the defects of the M-Defense?

Lieut. WELLS. The stabilizer and the elevator were too small.

Senator NEW. Both too small?

Lieut. WELLS. Yes. The cables were bent around and wired and soldered, instead of being spliced.

Senator NEW. Those are structural weaknesses of which you disapprove?

Lieut. WELLS. Yes, sir.

Senator NEW. And which make you fear to use the machine; is that correct?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you reported this to the department?

Lieut. WELLS. Yes, sir.

Senator NEW. You have sent it up through channels, I suppose?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you had any experience with the De H-4?

Lieut. WELLS. No, sir.

Senator NEW. Have you had any opportunities to observe the machine?

Lieut. WELLS. Yes, sir.

Senator NEW. What sort of an examination have you made of it?

Lieut. WELLS. The first time I saw one was in France.

Senator NEW. Was that an American-made De Haviland?

Lieut. WELLS. I presume it was. It was in the hands of Americans.

Senator NEW. Where was this?

Lieut. WELLS. This was at the Second Aviation Instruction Center.

Senator NEW. When was that?

Lieut. WELLS. In May, 1918.

Senator NEW. That was one of the first machines received over there, was it?

Lieut. WELLS. Well, that I could not say. It was the first one I had seen.

Senator NEW. You do not know where it was made?

Lieut. WELLS. No.

Senator NEW. You do not know whether or not it was an American-built machine?

Lieut. WELLS. I could not say positively.

Senator NEW. But your impression is that it was an American-built machine?

Lieut. WELLS. Yes, sir.

Senator NEW. What did you ascertain concerning it on that occasion?

Lieut. WELLS. Well, the stabilizer in the back of the machine was loose; that is, the fittings were loose enough so that you could take the stabilizer and lift it up and down about an inch. The cables were this turned-around affair, wired and soldered. The running gear did not look as strong as it might be.

Senator NEW. Was that machine in use?

Lieut. WELLS. It had been flown from a place called Romorantin.

Senator NEW. That is, it had been flown experimentally, you mean.

Lieut. WELLS. Well, that I could not say.

Capt. KELLEY. Romorantin is the assembly park for the American-built airplanes. The crates are all shipped there and the machines are to be assembled there and then flown to wherever they are wanted—to that point. That is going to be our big assembly plant.

Senator NEW. Did you hear any report made of the performance of that machine on that occasion?

Lieut. WELLS. No. If I remember correctly, this trip was made just to visit the second aviation instruction center. Whether they were trying out anything or not I do not know.

Senator NEW. Was anything said about the character or the quality of the machine on that occasion?

Lieut. WELLS. No, sir.

Senator NEW. Then, what became of it? Was it flown back?

Lieut. WELLS. No; it was taken down and sent back on a truck.

Senator NEW. Taken down and sent back to Romorantin on a truck?

Lieut. WELLS. Yes, sir.

Senator NEW. Why was that?

Lieut. WELLS. The machine met with an accident on landing and could not be flown back.

Senator NEW. Did you hear any opinion expressed by aviators over there, either our own or of the foreign forces, concerning the qualities of the De H-4?

Lieut. WELLS. At that particular time everybody was of the opinion that it was all right.

Senator NEW. What is the opinion now?

Lieut. WELLS. You mean over there or here?

Senator NEW. Do you know what it is over there now?

Lieut. WELLS. Well, when I left, those that I talked to did not care to do any acrobatics—any stunts with it.

Senator NEW. Why?

Lieut. WELLS. They did not think it was safe.

Senator NEW. Their opinion, then, had undergone a change?

Lieut. WELLS. Yes, sir.

Senator NEW. As a result of observation of the machine; is that it?

Lieut. WELLS. Well, that I do not know. You see, we were located at a different place entirely from where——

Senator NEW (interposing). What was responsible for that change of opinion?

Lieut. WELLS. Men who had visited the place, or met other aviators, or in flying over there; they had landed there, so that kind of talk finally sifted back where we were located, although I never saw any performance of the machine.

Senator NEW. Then, this was the gossip of that field, which simply drifted back to you through various channels?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you had any opportunity to form any opinion of the machine since you have been out at Wilbur Wright field?

Lieut. WELLS. I have looked the machines over—one in particular—at the Wilbur Wright field.

Senator NEW. Tell us how you happened to make that examination.

Lieut. WELLS. Being more or less interested in the testing department, I looked the machine over with others, and talked it over, and different things were pointed out to me that I had not noticed; so in that way I came to see these many faults that have been pointed out.

Senator NEW. What were some of those things that were pointed out to you?

Lieut. WELLS. These bolts and fittings in the main spar, upper and lower wings.

Senator NEW. You are referring now to the bolts through the spars, which were referred to by Capt. Kelley and Capt. Johnson in their testimony?

Lieut. WELLS. Yes, sir.

Senator NEW. In your opinion, what effect would the wearing of these bolts have upon the machine?

Lieut. WELLS. These bolts moving around, it would cause the hole to get larger, and as the hole got larger, the bolt would bend and, in time, break, and that would cause the wing to go off; and the wing going off, the machine would necessarily have to fall.

Senator NEW. Anything else?

Lieut. WELLS. The aleron, rudder, and elevator fittings do not seem to me strong enough.

Senator NEW. Anything else?

Lieut. WELLS. The location of the guns—the sights.

Senator NEW. You speak now of the machine-guns?

Lieut. WELLS Yes, sir.

Senator NEW. What is wrong with them?

Lieut. WELLS. I think the machine-guns are placed too high, and, being strapped in, a man could not very well take care of a jam. The sights I can not see through at all. They are way above me. I would have to loosen the straps and raise up in order to see.

Senator NEW. So that renders the gun of no use?

Lieut. WELLS. It would not be of any use to me if I wanted to make a shot at somebody. I could guess at it.

Senator NEW. But the arrangement of that, you think, is structurally wrong; that is, the location of the guns?

Lieut. WELLS. Yes; the location of the guns. There is one sight in particular that is off to one side, and you would have to lean way over this way [demonstrating] in order to see. You have still got to hold the stick in the middle to balance the machine, and the tendency is, in moving this way [demonstrating], to push the other up.

Senator NEW. The tendency is, you mean, in moving to one side, to put too great pressure on the stick you hold in the other hand?

Lieut. WELLS. No, sir.

Senator NEW. You can not lean without putting too much pressure on the stick, is that it?

Lieut. WELLS. That would be it. That would be the tendency. Of course, the machine would never get out of control, or anything like that; but if you got off of balance, it would spoil your shooting.

Senator NEW. While it might not overbalance the machine, it would spoil your shooting?

Lieut. WELLS. Yes, sir.

Senator NEW. Anything else?

Lieut. WELLS. The distance between the pilot and the observer is greater than it should be, making conversation out of the question without the aid of a telephone.

Senator NEW. From your experience, and basing your reply upon that, and upon your observation of the American D'H. 4, do you regard it as a good type of plane for combat purposes?

Lieut. WELLS. As it stands now?

Senator NEW. As it stands now.

Lieut. WELLS. No, sir.

Senator NEW. Have you ever had experience with day-bombing machines?

Lieut. WELLS. No, sir.

Senator NEW. Do you consider yourself qualified to pass judgment upon the D'H. 4 as a day bomber?

Lieut. WELLS. No, sir.

Senator NEW. What, if anything, should be done, or what can be done with the De Haviland 4 to make it an available and acceptable machine for combat purposes?

Lieut. WELLS. From the experience I have had, and from what I have seen of combat machines, I do not think the machine is that kind or type.

Senator NEW. You do not think anything can be done with it to make it an acceptable combat plane?

Lieut. WELLS. No, sir.

Senator NEW. For what purpose, then, do you think it might be used, if any?

Lieut. WELLS. Photographic work, and possibly regulating artillery fire.

Senator NEW. Do you think it should be used for any purpose until after the structural defects, of which you have spoken, have been remedied?

Lieut. WELLS. No, sir.

Senator NEW. Does that mean that you regard it as unsafe as it stands at present?

Lieut. WELLS. Yes, sir.

Senator NEW. It is one that a pilot should not be asked to use, in your opinion?

Lieut. WELLS. Yes, sir.

Senator NEW. When did you leave France?

Lieut. WELLS. July 24.

Senator NEW. June 24, you mean, do you not?

Lieut. WELLS. Yes, sir; June 24.

Senator NEW. Up to that time, had you ever seen any American planes used on the western front for combat purposes?

Lieut. WELLS. No, sir.

Senator NEW. Do you know whether any of them were being used for such purposes, up to that time?

Lieut. WELLS. Not that I know of.

Senator NEW. You had never heard of any?

Lieut. WELLS. No, sir.

Senator NEW. I guess that is all, lieutenant. Is there anything further you would like to say?

Lieut. WELLS. Why, it is just about the same as Capt. Kelley and Capt. Johnson have said; but there is one thing that I would like to emphasize—these cables. The method of turning the ends of the cable, wiring, and then soldering. That is something I have never seen on a French machine, and the fact that it is wired and soldered makes it difficult to know whether the solder has gone in far enough to make it as strong as it should be. All of the cables over there on the French machines are spliced.

Senator NEW. And you think that the splicing method is the one that should be employed?

Lieut. WELLS. Yes, sir.

Senator NEW. You heard the evidence given by Capt. Kelley and Capt. Johnson?

Lieut. WELLS. Yes, sir.

Senator NEW. Do you agree with that?

Lieut. WELLS. Yes, sir.

Senator NEW. If you differ with it, at any point, I would like for you to explain just wherein you differ.

Lieut. WELLS. No. I agree with them in everything they have said.

Senator NEW. I think that is all.

Lieut. WELLS. There is this one more thing. This fabric. In the French Army—well, I will not say “in the French Army,” but under French management, both at the front and in the rear, when fabric becomes what they call “dead” or “soft,” where you can put your

finger in it and the dent still remains, either new linen is put on or the old dope is scraped off, and it is redoped.

Senator New. And that is something that should be done?

Lieut. WELLS. I think so. When fabric is like that, it is hard to tell whether it is old fabric or not. I think it is the paint.

Senator New. That is all, Lieut. Wells.

(Whereupon the committee adjourned, subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 2, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met at 2 o'clock p. m., pursuant to adjournment, in the committee room, Capitol Building, Hon. Harry S. New presiding.

Present: Senators New and Reed.

STATEMENT OF NAVAL CONSTRUCTOR J. C. HUNSAKER, UNITED STATES NAVY—Continued.

Senator NEW. Constructor Hunsaker, you were here as a witness a few days ago, and, on that occasion, reference was had to the fact that a number of DeH4 planes had been delivered to the Navy. You recall that?

Constructor HUNSAKER. Yes, sir.

Senator NEW. The test had been conducted on four of the planes selected from that lot which had been sent to the naval testing station at Miami, Fla., I believe?

Constructor HUNSAKER. Yes, sir.

Senator NEW. You said, I believe, that 28 of those machines had been shipped abroad?

Constructor HUNSAKER. Yes, sir. I think I said 28, but the number is 50. After leaving the other day I looked up the shipments within 24 hours, and a few more had got away from us, so substantially 50 are on their way to France, and substantially 100 are on this side.

Senator REED. All of the same type and kind?

Constructor HUNSAKER. Presumably.

Senator REED. You say "presumably." When I say "all of the same type and kind" I do not mean to confine you so that if a piece is changed, or something or other is wrong in the construction, but I want to know if they are the same kind of machine and the same type of machine.

Constructor HUNSAKER. Yes, sir; they are all De Havilands.

Senator REED. De Haviland 4's?

Constructor HUNSAKER. Yes, sir.

Senator REED. And all planned and built in the same factory, were they?

Constructor HUNSAKER. Yes, sir.

Senator REED. That is, they were built there, anyway, wherever planned.

Constructor HUNSAKER. Yes, sir.

Senator REED. And there is no difference between the machines, so far as the general plan of construction is concerned?

Constructor HUNSAKER. There is not; no, sir.

Senator NEW. We are speaking of a lot of De Haviland 4 planes concerning which you testified on your previous visit.

Constructor HUNSAKER. Yes.

Senator NEW. At that time, Constructor Hunsaker, you said that it had not been definitely determined whether that 100 planes that had not been shipped would be kept on this side or forwarded to France?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Can you tell us now what disposition has been made of those planes?

Constructor HUNSAKER. It has been arranged to return those planes to the Bureau of Aircraft Production; and the Bureau of Aircraft Production of the War Department has agreed to replace them with similar planes of later manufacture, which they can guarantee to be safe.

Senator NEW. The Navy refused to accept those 100 planes; that is correct, is it?

Senator REED. Let me put it this way: Why were they returned?

Constructor HUNSAKER. The planes were returned because of defective workmanship. These planes were the first of the production of a new factory.

Senator REED. What factory?

Constructor HUNSAKER. The Wright-Dayton.

Senator NEW. The Dayton-Wright?

Constructor HUNSAKER. I will correct that statement; the Dayton-Wright Co., at Dayton, Ohio.

Senator REED. What were the defects?

Constructor HUNSAKER. The defects were general workmanship, such as the method of splicing wires, attaching fabric to the planes, the rigidity of the tail structure, certain fittings which anchor the drift wires for the wings, and other items, which I think were mentioned in my testimony at the last hearing.

Senator NEW. They were included in a report made by Capt. McCaughtry, were they not?

Constructor HUNSAKER. Yes, sir.

Senator REED. When was that made?

Constructor HUNSAKER. Those were largely matters of inspection and workmanship.

Senator REED. When was that report made?

Senator NEW. That report was dated July 16, 1918. That is all I wanted to ask on that subject, Senator Reed. If you have anything further you wish to ask——

Senator REED. I want to get a little more detail in regard to the different defects. You say the splicing of the wires was defective?

Constructor HUNSAKER. Yes.

Senator REED. What is that splicing you refer to? Do you refer to the place where the wires are doubled back on themselves and then wound and soldered?

Constructor HUNSAKER. I think so. I did not see the defective splicing myself, but I recall from the report of the inspection that certain of the wire terminals, which presumably had an eye splice in the end, were not well made.

Senator REED. Do you know whether or not that defect was visible to the naked eye after the wrapping had been completed and solder had been put over it—whether it then was in such shape that it could have been discerned—the weakness of it or the improper construction?

Constructor HUNSAKER. I doubt it.

Senator REED. But it could have been discerned by proper inspection while the work was in progress, could it not?

Constructor HUNSAKER. It is extremely difficult even then. The security of the wire splice which involves solder can only be tested by breaking certain of them at random.

Senator REED. Well, you could tell whether the work was being done right, could you not?

Constructor HUNSAKER. If you stood over the men.

Senator REED. Yes. Well, I am talking about proper inspection, and I take it that means to stand over the work enough to see how the work is being done, does it not?

Constructor HUNSAKER. No, sir. In a large factory it is impossible. There are too many thousand workmen and there are too few inspectors to make that possible.

Senator REED. I am still talking about a competent inspection. I am not talking about the kind of inspection we are giving now, but whether, if a man saw the work being done—and I grant you that is impossible in each instance—if he then could see whether these defects existed or whether the defect was in the method of fastening the wires? Which was it?

Constructor HUNSAKER. I do not know which it was.

Senator REED. You do not know which?

Constructor HUNSAKER. No, sir.

Senator NEW. Is not that, as a matter of fact, a structural defect, rather than a defect of workmanship?

Constructor HUNSAKER. No, sir; I think it is workmanship.

Senator NEW. What I mean is, should not that be a splice rather than to have one end of the wire doubled back on another end and soldered to it, as it is in the case to which you refer?

Constructor HUNSAKER. If the job is properly done, there should be no choice between the two ways of making the wire terminal.

Senator REED. Well, you found these splices weak, at any rate, did you?

Constructor HUNSAKER. The commanding officer at Miami found them so; yes, sir.

Senator REED. Would that make the plane dangerous to the man who flew it?

Constructor HUNSAKER. Yes, sir.

Senator REED. Those splices were liable to give way while the machine was in the air, were they?

Constructor HUNSAKER. Yes, sir.

Senator REED. You spoke of the improper attaching of the fabric to the wings?

Constructor HUNSAKER. Yes, sir.

Senator REED. Do you know whether that was a proper method of applying the fabric, or whether it was the arch of the wings, or whether it was the weight of the load that occasioned the fabric to give way, or was it all of these things combined?

Constructor HUNSAKER. All things enter into it, but the fabric was not well stitched to the framework of the wings.

Senator REED. Was that a thing that could have been discovered by proper inspection?

Constructor HUNSAKER. Yes, sir.

Senator REED. There ought to be enough inspectors at a factory to see that, anyway, ought there not?

Constructor HUNSAKER. Yes, sir.

Senator REED. What I understand you to mean, when you say it was improper stitching, is that it was unsafe stitching, and of such character that the fabric might give way?

Constructor HUNSAKER. Yes, sir.

Senator REED. Then, of course, we know what would happen if that occurred in the air. Now, you spoke of certain fittings which were employed to attach the wings to the—was it to attach the wings to the fuselage?

Constructor HUNSAKER. No, sir. There are certain fittings on the forward end of the fuselage to which wires are anchored. These wires are called drift wires, and lead back toward the wings, and serve to brace the wings against folding to the rear. Those fittings were not so strong as the wires which were anchored to them, and are being changed in all new machines.

Senator REED. The fittings were too weak, so that the wings were liable to give way?

Constructor HUNSAKER. Either the fitting or its method of attachment to the wooden part.

Senator REED. Now, which was it? Could you tell us?

Constructor HUNSAKER. Possibly both.

Senator REED. Both?

Constructor HUNSAKER. I know that the Army proposes now to put a tie-bolt at that place.

Senator REED. Were not nearly all of these defects of which you have spoken either structural, so that they ought to have been discovered by competent aeronautical engineers, or the result of bad workmanship, which ought to have been discovered by a proper inspection as the work progressed?

Constructor HUNSAKER. I suppose the majority of them might have been detected.

Senator NEW. Do you not think they should have been detected?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Do you think the kind of inspection that permits that sort of patch work to pass is proper inspection?

Constructor HUNSAKER. No.

Senator REED. You turned back all of these machines that had been turned over to the Navy?

Senator NEW. All that had not gotten away from them.

Senator REED. That is, all that had not gotten away to France?

Constructor HUNSAKER. All that had not been shipped, except four that are in Florida and will be repaired.

Senator REED. That is, you have four that you are going to try to patch up?

Constructor HUNSAKER. Yes, sir.

Senator REED. How many do you say went abroad?

Constructor HUNSAKER. About 50.

Senator REED. What steps have been taken to prevent the employment of those machines on the other side, before they are reconstructed?

Constructor HUNSAKER. I understand the Office of the Chief of Naval Operations will communicate with the American naval organization in charge of aviation in France, informing them of the situation in regard to the planes, and advising them to get in touch with the experts who are to be sent abroad to fix up Gen. Pershing's planes, and to arrange to have the naval planes fixed up at the same time and by the same people.

Senator REED. There is a force of men being sent abroad, then, to try and patch up the planes that have already been sent to Pershing; is that the case?

Constructor HUNSAKER. I know nothing of it from my own knowledge. I understand that certain men—I do not know whether it is enough to be called a "force" are already on their way abroad.

Senator REED. Who sent them? The War Department?

Constructor HUNSAKER. Yes, sir.

Senator REED. How many are there, do you know?

Constructor HUNSAKER. No, sir.

Senator REED. Do you know any of them?

Constructor HUNSAKER. I understand that Col. Hall has already sailed.

Senator REED. The Hall who had to do with the Liberty motor—that Hall?

Constructor HUNSAKER. I do not know.

Senator REED. The Liberty motor is theoretically supposed to have been principally created by Col. Vincent and Col. Hall, then civilians. I was wondering if it was the same Hall?

Constructor HUNSAKER. I did not inquire. I was told it was "Col. Hall."

Senator REED. Do you know whether he had been recently at the Dayton-Wright plant, doing the inspecting there, and at the Curtiss plant? Do you know whether it is the same Hall?

Constructor HUNSAKER. No, sir; I do not know.

Senator REED. Well, what department or division of the War Department sent these men? Do you know that?

Constructor HUNSAKER. The Bureau of Aircraft Production.

Senator REED. Do you know when they were sent?

Constructor HUNSAKER. No, sir.

Senator REED. When did you first hear of them being sent? About how long ago?

Constructor HUNSAKER. Last Monday.

Senator REED. Which would be July what?

Constructor HUNSAKER. Twenty-ninth.

Senator REED. What I am trying to get you to do is to give us the information, as best you have it, as to about when these men were sent over to repair these planes or to rebuild these planes that have been sent to Gen. Pershing.

Constructor HUNSAKER. I am not a good witness for that. I know nothing about it.

Senator REED. When do you understand them to have gone? I am not asking you to be technical. I just want the information for what it is worth.

Constructor HUNSAKER. I did not bother to inquire. I was told that Col. Hall had left some time ago and was on his way.

Senator REED. Did the Navy need these planes when they got them?

Constructor HUNSAKER. Yes, sir; the Marine Corps did.

Senator REED. The Marine Corps did?

Constructor HUNSAKER. Yes, sir.

Senator REED. To operate in France or to operate in other places?

Constructor HUNSAKER. In France.

Senator REED. Do you know whether they have a single American-made plane now, except these defective ones that have been started over there?

Constructor HUNSAKER. Our marines?

Senator REED. Yes.

Constructor HUNSAKER. I believe not.

Senator REED. Do you know whether any of these planes that were started over there—these DH. 4's—have arrived?

Constructor HUNSAKER. No, sir.

Senator REED. Do you mean by that that they have not arrived or that you do not know?

Constructor HUNSAKER. That I do not know whether they have or not.

Senator REED. When were they sent?

Senator NEW. Will you let me ask a question right there, ahead of that, Senator?

Senator REED. Yes.

Senator NEW. Will the use of those planes that have now been shipped be permitted until after they have been overhauled and placed in condition, if it is possible to put them into condition?

Constructor HUNSAKER. I do not know whether it will be permitted, but full information will be supplied the people who might have to use them as to their condition.

Senator NEW. Those people will be advised that those machines are dangerous and not fit for use; is that true?

Constructor HUNSAKER. I do not know exactly the form of the advice. I suggest you ask Capt. Irwin, who, I understand, will follow me here. He is in charge of all naval operations of aircraft.

Senator NEW. As a matter of fact, you do not regard those machines as safe in their present condition, do you?

Constructor HUNSAKER. I do not; not, sir.

Senator REED. Who is in command of the Marines who are in France; do you know?

Constructor HUNSAKER. No, sir.

Senator REED. What have the Marines been doing for airplanes up to this time in France?

Constructor HUNSAKER. I do not know that either.

Senator REED. Now, do you know anything about the other planes that have been built for the Navy besides the De Havilands?

Constructor HUNSAKER. We have got from the Army a rather large quantity of Curtiss JN 4 airplanes, and some Thomas-Morse, and are now getting a few small planes, made by the Standard Aero Corporation, of the training type.

Senator REED. Standard No. 4, did you say it is?

Constructor HUNSAKER. The Curtiss JN 4.

Senator REED. Yes; but what is this third type you named?

Constructor HUNSAKER. Standard Type M.

Senator REED. They are all training planes, are they?

Constructor HUNSAKER. Yes, sir.

Senator REED. Does the JN 4 work reasonably satisfactorily?

Constructor HUNSAKER. Yes, sir.

Senator REED. The Thomas-Morse—how did they work?

Constructor HUNSAKER. We had no complaint about it.

Senator REED. What was the engine employed in the Thomas-Morse; what motor?

Constructor HUNSAKER. The Gnome.

Senator REED. Did you have any trouble in getting all of those Thomas-Morse machines you desired?

Constructor HUNSAKER. We did not desire very many of them.

Senator REED. How many of them did you want?

Constructor HUNSAKER. I am not prepared with the actual number. Do you know, Capt. Irwin?

Capt. IRWIN. I do not remember now.

Constructor HUNSAKER. It was not a large number, and the Army gave them to us very promptly.

Senator REED. Did you get all the Curtiss planes that you needed?

Constructor HUNSAKER. Yes, sir; very promptly, and they were very satisfactory.

Senator REED. The Standard M, what engine has that?

Constructor HUNSAKER. That is the Gnome also.

Senator REED. Did those machines work satisfactorily?

Constructor HUNSAKER. I think we have not yet put them in service.

Senator REED. Oh, I want to go back to the defects. There is one thing I did not speak of. You said "the rigidity of the tail." I am speaking now of the DH4. Do you mean that the tail was not sufficiently rigid or that it was too rigid?

Constructor HUNSAKER. Not sufficiently rigid.

Senator REED. What was the reason that it was not sufficiently rigid? What was the fault in the construction there?

Constructor HUNSAKER. There was not enough bracing, but they have been able to correct it by the addition of steel tubing.

Senator REED. Now, coming back again to the other planes that the Navy has; what other planes has the Navy received, either built for themselves or received from the Army?

Constructor HUNSAKER. I recall no other planes received from the Army. We build our own seaplanes independently.

Senator REED. That is, you have them built?

Constructor HUNSAKER. We have them built and build them ourselves, in our own factory, both.

Senator REED. Where is your own factory?

Constructor HUNSAKER. At the navy yard, Philadelphia. We have the naval aircraft factory there.

Senator REED. How many of those seaplanes have you turned out at the Government factory?

Constructor HUNSAKER. About 60.

Senator REED. With what motor are they equipped?

Constructor HUNSAKER. Each carries two Liberty engines.

Senator REED. Who designed those seaplanes that you are speaking of?

Constructor HUNSAKER. The design has been a development from Mr. Glenn Curtiss's original "America" of 1912-13, which was, as you know, unsuccessful. Its successive modifications were carried out by Mr. Curtiss, with various other engineers contributing ideas, until they developed the Curtiss model H-12, which was built for the British Admiralty and shipped to England during the years 1915-16, I believe, or 1917. The English have redesigned the H-12, and have returned it to us as the H-16.

Senator REED. Is that what you are now building?

Constructor HUNSAKER. It is that which we are building, and we are proceeding to change to the latest improvement of the H-16, also made after British experience, called the F-5.

Senator REED. Who made the latest design; American or English engineers, changing from the H-16 to the F-5?

Constructor HUNSAKER. The general design came from England, and American engineers have had to modify it to take the Liberty engine, and to suit our conditions of quantity production.

Senator REED. Have the changes been radical or have they simply been in the nature of modifications?

Constructor HUNSAKER. They have been in the nature of modifications, but to the extent of some 2,000. A complete redesign of all details. The general type remains the same.

Senator REED. In other words, you recognize in the Navy the fact that if a machine has been designed originally for a certain kind of engine, of a certain horsepower, and you change the weight of the engine and the power of the engine, that that necessarily involves changes in the fuselage and changes in the wings, and in all parts of the airplane?

Constructor HUNSAKER. In these boats we were not concerned with any great difficulty, because they had in England the Rolls-Royce engine, which is substantially of the same weight and power as the Liberty motor.

Senator REED. Senator New, I am going to have to excuse myself. I have just gotten word of the death of a very close friend, and I will have to go now, and you will go ahead with the hearing. The officers will excuse me and I will read their testimony.

Senator NEW. Yes, Senator. Just what is the Navy building? What is your program?

Constructor HUNSAKER. The Navy is building, as its program, the H-16, or its improvement, the F-5 flying boat, with twin Liberty engines, and the HS flying boat, with single Liberty engine. These machines are service types and are sent abroad. In addition to these

types we construct for school purposes a 100-horsepower single-float seaplane made by the Aero Marine Plane & Motor Co., of Keyport, N. J.; a 100 horsepower single-float training seaplane, by the Boeing Airplane Co., of Seattle, Wash.; a 100 horsepower training flying boat, by the Curtiss Engineering Corporation, Garden City, N. Y.; and a 150 horsepower single-float training seaplane, by the Burgess Co., of Marblehead, Mass. The principal production is divided between this training craft and the two types of service craft. Besides these we have always under construction various experimental designs, which may have been initiated either by private firms or by the Navy Department. In these cases a few units only are built for demonstration and decision whether they are of sufficient merit to warrant their production for service use.

Senator NEW. Have the various boats that have been delivered to the Navy been satisfactory?

Constructor HUNSAKER. I think I can answer that the boats are satisfactory, although, of course, we have minor defects which develop from time to time, and improvement must be constant. The general theory under which the Navy operates is that the operating personnel—that is, the flyers—are the customers, and they must be supplied with what they want. The structural safety and integrity of the machines supplied is guaranteed by the matériel bureau supplying them.

Senator NEW. The defects of which you speak you regard as minor defects, do you?

Constructor HUNSAKER. They are minor to the extent that as soon as they are known they can be and are corrected.

Senator NEW. That is it; they are such mistakes as can be corrected?

Constructor HUNSAKER. Yes, sir.

Senator NEW. And do not so impair the strength or character of the machine as to render it obsolete—as to call for its rejection?

Constructor HUNSAKER. No, sir.

Senator NEW. Constructor Hunsaker, I think that is all I care to ask you, except that when you were last here you had a report of the test made on four De Haviland-4 machines at Miami, that report having been filed by Capt. McCaughtry under date of July 16. Will you please supply the committee with a copy of that report? Can you do so?

Constructor HUNSAKER. I think I must have the permission of the Secretary of the Navy. Under the naval regulations, I am bound not to divert any official correspondence, or copies of it, outside of the Naval Establishment.

Senator NEW. Of course, I do not want to call on you to supply anything that you should not supply, or anything of that sort.

Constructor HUNSAKER. I venture to suggest, sir, that you request the Secretary of the Navy——

Senator NEW. I know that request has been made of the Secretary, and it probably will come in that way. That is all right.

Capt. IRWIN. I can tell you that was sent, sir.

Senator NEW. It has been?

Capt. IRWIN. Yes, sir; it was mailed last night.

Senator NEW. All right. Then, I think that is all at present, Constructor Hunsacker. Now, Capt. Irwin, will you take the stand?

STATEMENT OF CAPT. N. E. IRWIN, UNITED STATES NAVY.

Senator NEW. What is your present detail of duty?

Capt. IRWIN. Director of Naval Aviation, under the Chief of Naval Operations.

Senator NEW. Can you tell us just what the Navy program is: that is, what different types of aircraft, hydroplanes, and so on, the Navy is producing?

Capt. IRWIN. In heavier-than-air craft, for service use, we are producing the large two-engine flying boat, called the H-16, and a smaller type using one engine, called the HS-1—HS-1 or 2, according to the number; and for training purposes we are using the N-9, which is a seaplane that very much resembles the Army JN-4; the Aero Marine, which is very similar to the N-9 in its general outline, and the training boat, called the F boat—a small type of boat.

Senator NEW. Have the different types of planes which you have just enumerated, as delivered to the Navy, been reasonably satisfactory?

Capt. IRWIN. Yes, sir; reasonably so.

Senator NEW. You have not been called upon to reject any of them?

Capt. IRWIN. Some of the Aero Marines, when they were first delivered, developed weaknesses that we discovered, and we had to get new parts in the place of them before we could go on and use them.

Senator NEW. What was the character of those weaknesses?

Capt. IRWIN. It was in the bedplate of the engine, which was a special design of the Aero Marine Co., and it did not develop until after the engine had been running for some time.

Senator NEW. What was the type of engine?

Capt. IRWIN. The Hall-Scott 4-cylinder. These defects were apparently developed, due to the vibration of the engine, after some hours of flying.

Senator NEW. What was the conclusion of the Navy with reference to the Hall-Scott engine?

Capt. IRWIN. Well, we have stopped the use of it.

Senator NEW. You have abandoned its use?

Capt. IRWIN. Yes, sir.

Senator NEW. What was done with the planes in which it was used?

Capt. IRWIN. The ones that had been flown for some time were strengthened in those places where they gave way, and the new ones were supplied with new parts.

Senator NEW. All of them reequipped?

Capt. IRWIN. Yes, sir.

Senator NEW. With engines of a different type?

Capt. IRWIN. No, sir; I do not think so. We continued to use the Hall-Scott, but we changed, after a certain number had come out, to the Curtiss engine, but we strengthened the plane so that it would resist the vibration even of the Hall-Scott.

Senator NEW. But I understand, do I, that the Hall-Scott is not used at all now by the Navy?

Capt. IRWIN. It is not being produced any more. There may be some still in use in the Navy.

Senator NEW. I asked that for the reason that Gen. Kenly testified here that the Army had entirely abandoned the use of the Hall-Scott machine; that 1,200 standard training planes equipped with Hall-Scott engines were relegated on account of the engine——

Capt. IRWIN (interposing). Scrapped?

Senator NEW. Well, their use discontinued.

Capt. IRWIN. We have discontinued their use, but the ones that were actually gotten on contract, before we concluded that they were not satisfactory, we have gone on and used them. I do not think it would make the plane dangerous, but they will give way or wear out quicker, and are harder to keep up.

Senator NEW. Captain, what information have you concerning the DeH4 planes which were recently delivered to the Navy for the Navy's use?

Capt. IRWIN. You mean what information relative to their condition?

Senator NEW. Yes.

Capt. IRWIN. We received a report from the commanding officer of the Marine Flying Field, at Miami, where four of these planes had been sent for training purposes, stating a number of defects that he had noticed in the planes. That report, as soon as received, was forwarded on to our matériel bureau that looks after the provision of the machines, and they took it up with the production division of the Army; and I afterwards learned, or was informed, that most of these defects—most, if not all, of them—had been previously reported to the Army, and that they had taken steps to make them good.

Senator NEW. But do you recall just how many of those planes were delivered to the Navy in that defective condition?

Capt. IRWIN. No, sir; I could not state that, because I do not think anyone would know where changes had been made in the machines that came along. We did not get them all at one time, and these four that were sent to Miami were among some of the first that we received.

Senator NEW. The Navy had had in an order for a given number of DeH4 machines?

Capt. IRWIN. Yes, sir.

Senator NEW. Can you tell us how large an order that was?

Capt. IRWIN. One hundred and fifty-five.

Senator NEW. One hundred and fifty-five?

Capt. IRWIN. Yes, sir.

Senator NEW. Then Constructor Hunsaker has testified that about 50 were actually shipped abroad?

Capt. IRWIN. Yes, sir.

Senator NEW. And that about 100 had been rejected here and returned to the production department; that is correct, is it?

Capt. IRWIN. Well, after this report of defects was made to us we said we did not believe these others, the remaining 100, should be

sent abroad, and we took it up with the Army, and they said they would take them back and make good the defects.

Senator NEW. If that is the case, it is true, however, that the entire order of 150 machines ordered by the Navy was delivered in that defective condition?

Capt. IRWIN. Not necessarily, according to my understanding, sir, because this delivery has been going on for a period of over two months, and I understand they have remedied in the later machines some of the defects that were in the first machines.

Senator NEW. This 100 machines were not accepted?

Capt. IRWIN. No, sir; because we do not know where the remedies were installed, and in order to make a clean job of it——

Senator NEW (interposing). The Navy has declined them all?

Capt. IRWIN. The Navy has sent all of them to be inspected and to see that the defects have been made good.

Senator NEW. Will the use of the 50 that were sent abroad be permitted before they are overhauled and those defects remedied?

Capt. IRWIN. We are preparing a telegram to the commander of the aviation forces abroad now telling him all of the defects.

Senator NEW. Who is the commander abroad?

Capt. IRWIN. Capt. Cone. The telegram, of course, will go to Admiral Sims.

Senator NEW. The telegram will go to Admiral Sims and down from him through naval channels?

Capt. IRWIN. Yes, sir.

Senator NEW. Are you at liberty to state what the character of that cablegram will be?

Capt. IRWIN. Well, in a general way, stating all of the defects that have been reported to us, and to take it up with the Army as to the best way of repairing them or making them good. I say, "taking it up with the Army," because they probably have better facilities at their assembling base there for making these changes or replacing these things.

Senator NEW. Captain Irwin, it is perfectly well known that the Army has met with many difficulties in its aircraft production program and some conspicuous failures. I would like to ask you if the Navy has had corresponding difficulties of major or minor importance.

Capt. IRWIN. We have had difficulties. I do not think I would call them of major importance, but both the matériel bureaus and the Office of Operations—that is, the matériel section of the Office of Operations—try to have the commanding officers of the air stations report all defects or supposed defects that they find in the machines that are issued for use, and to keep on reporting those continuously. It may be simply that they think they do not operate well, and when we get those reports in we take it up with the matériel bureaus, and sometimes they agree at once that it is a defect; that it has been reported, and they start in to make it good. On other things, after talking it over, we say that the man who made the report is in error: that he wants an easy appliance for operating, and we do not make the change. We decide there in the department whether it will be done or not.

Senator NEW. Have such a number of reported defects come with reference to any one particular type of plane in use by the Navy as to indicate that that type should be abandoned—or I will change the last of that question; I do not care to say “should be abandoned,” perhaps, but that the manufacture of that type should not be continued?

Capt. IRWIN. I do not remember any that we have had in quantity production. We have had some that we had gotten a small number of—that is to say, we had gotten one and tested it out, and thought it was going to be a good machine—one or two—and we had gotten a dozen or more, and with a little more use we decided that was not a suitable machine and discontinued it. Now, the defects in the Aero Marine that I have mentioned—it could not have been continued in its original form of production; that is, with the original material, the way it was put into it—in the original form of manufacture.

Senator NEW. There were substantial changes found necessary in that?

Capt. IRWIN. Yes, sir.

Senator NEW. Are you still making them?

Capt. IRWIN. Yes, sir. That is correct, isn't it?

Constructor HUNSAKER. Yes.

Capt. IRWIN. It is a training machine.

The CHAIRMAN. On July 29 last I wrote the Secretary of the Navy requesting a copy of a report on “Defective parts found on De Haviland airplanes” as submitted by Capt. McCaughtry, which I now have, and will ask the stenographer to have the same inserted in the record at this point.

(The matter referred to is here printed in full as follows:)

NAVY DEPARTMENT,
OFFICE OF NAVAL OPERATIONS,
Washington.

Hon. C. S. THOMAS,

*Chairman Subcommittee on Military Affairs,
United States Senate, Washington, D. C.*

DEAR SENATOR: The receipt is acknowledged of your letter of July 29, 1918, requesting for the use of the Subcommittee of the Military Affairs Committee investigating the production of aircraft a copy of a report on “Defective parts found on De Haviland airplanes” submitted by Capt. Walter E. McCaughtry, United States Marine Corps, commanding the Marine Flying Field at Miami, Fla.

A copy of the report mentioned is herewith inclosed as requested by you. In connection with this report I am glad to inform you that this matter has already been taken up by the Bureau of Construction and Repair of the Navy Department with the Aircraft Production Division of the War Department, and information has been received that the defects mentioned in this report had practically all previously been presented to the Production Division and steps had been taken to remedy them in future output of this type of machine.

Very truly, yours,

JOSEPHUS DANIELS.

MARINE FLYING FIELD,
Miami, Fla., July 16, 1918.

From: Commanding Officer.

To: Director of Naval Aviation, United States Navy, Washington D. C.

Subject: Defective parts found on De Haviland airplanes.

Reference: (a) Op. Air 0146-Y-66, letter Naval Operations, July 18, 1918.

1. Numerous cases of wire terminals pulling out have been found on the De Haviland type machines at this station. Close inspection of all terminals on these machines shows that while on many the free end has not started to

pull out, practically all are loosened until they are unfit for further service. The cause of the failure of these terminals is that the wrapping is all in one section, no spacing being allowed for the solder to run in. Terminals taken from these machines were unwrapped without applying heat to the solder, thereby proving that the thimbles are held in place by the friction of the wrapping alone and not by accepted solder-filled connection.

2. The aileron control sheaves on the upper panel are causing much trouble through defects which are as follows: (a) Bending of the bolts which holds the fitting to the spar, thus causing the sheave to be out of line with the control. (b) By shearing the bearing stud, which allows the sheaves to come entirely loose from the fitting.

3. The stream-line shields covering the sheaves do not allow for any inspection of these connections. This should be remodeled by cutting away part of the shield or by changing its form.

4. The horizontal stabilizer is too weak in structure to be used for instruction purposes. It is recommended that for this use the horizontal stabilizer be made more secure by further bracing, as sharp glides show excessive vibration.

5. Some cases of control cable terminals, letting go were found, the cause being the same as those assigned to other wires.

6. The fabric used on these machines has never been properly stretched. This is probably due to not enough "dope" having been applied, or to an inferior grade being used. The thread that holds the fabric to the ribs pulls through, allowing the fabric to raise up from the ribs. With all machines at the station it has been necessary to restitch the fabric, and it is recommended that all surfaces be re-covered with a better grade of fabric.

7. The pin that secures the axle cap has in several instances sheared off. This allows the wheel to come off. Larger pins should be used in this place.

8. The aluminum stream line shield covering, the landing gear shock absorbers should be made of a stronger material, as vibration causes the aluminum to break off where it is secured to the struts.

9. The brace wires inside the fuselage used on this machine are unsafe, as they are held in place only by lock nuts on each end. An examination of these wires shows that after a few hours flight a majority of those lock nuts have backed off, allowing the brace wires to screw out.

10. The drag wires are too small to take up the necessary load. This is shown by the fact that they all show signs of strain after a few flights. It is recommended that these wires be made double strength.

11. It is the opinion of pilots flying this machine that entirely too much force must be applied to the stick to operate the controls. It is recommended that more leverage be given, as it is often vital to have the controls respond quickly.

12. The foot board next to the fuselage on the wings should be made to extend to the entering edge. This would save the wing from getting broken up in front.

13. At present the wing skids are secured by a bolt on the outside of the fitting and a small wood screw on the inside. The screw pulls out, allowing the skid to break or bend in landing. The screw should be replaced by a bolt.

14. The arrangement of the radiator overflow is very inconvenient. The overflow is taken from the radiator cap. This necessitates breaking the overflow line each time the radiator is filled or inspected. It is recommended that this overflow be taken out below this cap.

15. The auxiliary gas tank overflow is so located that there is considerable loss of gasoline when the machine is put in a glide. It is recommended that this overflow be placed on the top of the wing where the filler-cap is situated.

16. Much trouble in the cock pit has been experienced due to radiator shutter control handle interfering with the operation of the synchronizing pump. It is recommended that the shutter control cable be made longer so that the shutter handle will clear the pump.

17. The design of the fuselage gives a poor view from the cock pit.

18. The spacing of the ribs of the wing in the outer section is so great that it is almost impossible to keep the fabric secured.

19. With the machines in their present condition, it is considered that they are not safe for flying, and it is recommended that they be temporarily placed out of commission until material and parts can be secured to eliminate the defects above mentioned.

WALTER E. McCAUGHTRY,
Captain, United States Marine Corps, Commanding.

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
Washington, July 27, 1918.

From: Maj. H. S. Brown, Chief of Finance Division.
To: The Hon. Charles S. Thomas, United States Senate, Washington, D. C.
Subject: Cancellation of Bristol contracts.

1. Complying with your letter of the 22d instant, addressed to Maj. F. E. Smith.

2. Attached hereto is copy of memorandum addressed to me by Capt. M. J. Abbott, under date of July 27, 1918, which is self-explanatory.

3. Briefly, we estimate that the cost of the cancellation of the Bristol contracts (planes and spares) will total \$6,482,000, subject to a material deduction for salvaging, the amount of which can not be estimated without a more detailed survey than we have been able to make at the present time.

H. S. BROWN.
Major, Signal Corps, Chief Finance Division.

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
July 27, 1918.

From: Capt. Abbott, finance department, approvals section.
To: Maj. H. S. Brown, finance department, administration section.
Subject: Cancellation of contracts in connection with Bristol planes.

1. In connection with letter of July 22, from Mr. C. S. Thomas, of the Senate Subcommittee on Aviation, in which he requests statement of the cost incurred by the Government of the United States in designing, constructing, and testing the Bristol planes, now abandoned by official order.

2. The contracts involved in this cancellation are contract No. 2463, with the Curtiss Co., which contract calls for 2,000 planes and certain specified spare parts; contract No. 2800, with the Lewis Spring & Axle Co., for certain specified spare parts; contract No. 2798, with the Hayes Ionia Co., for certain specified spare parts.

3. The amounts of the contracts involved are: Curtiss Co., spare parts, \$5,770,521.58; planes, \$13,500,000; Hayes Ionia Co., \$1,890,000; Lewis Spring & Axle Co., \$1,890,000; making the total amount of contracts involved \$23,050,521.58.

4. The estimated costs of the cancellation of the above-mentioned contracts are as follows: The Curtiss Co., \$6,000,000; the Lewis Spring & Axle Co., \$160,000; the Hayes Ionia Co., \$313,000; making a total of \$6,482,000.

5. You will find attached hereto five copies of the details showing how these figures were compiled.

6. I feel that the amounts shown as costs of cancellation are liberal and will be reduced materially by salvaging the materials involved.

By authority of Maj. Frank E. Smith.

Capt. M. J. ABBOTT,
Finance Division, Approvals Department.

Estimated cost of cancellation in connection with Bristol contract.

Curtiss Co.:		
Paid voucher	\$1, 250, 000. 00	
Unpaid vouchers and damages.....	4, 750, 000. 00	
		\$6, 000, 000. 00
Lewis Spring & Axle Co.:		
Paid vouchers	41, 000. 00	
Vouchered but not paid.....	41, 000. 00	
To be vouchered	25, 000. 00	
Estimated cancellation charges.....	16, 000. 00	
Overhead and depreciation	33, 000. 00	
Profit, 10 per cent less tools, etc.....	13, 000. 00	
		169, 000. 00

Haynes Ionia Co.:

Vouchered and paid-----	\$110,000.00	
Vouchered and not paid-----	26,000.00	
Overhead and depreciation-----	24,000.00	
Estimated cancellation charges-----	138,000.00	
Profit, 10 per cent less special tools-----	15,000.00	
		<u>\$313,000.00</u>
		<u>6,482,000.00</u>

Contractors involved in cancellation:

Curtiss Co.—

Spares-----	5,770,521.58
Planes-----	13,500,000.00
Haynes Ionia, spares-----	1,890,000.00
Lewis Spring & Axle Co., spares-----	1,890,000.00

Total amount contracts involved----- 23,050,521.58

Senator New. Captain, I think that is all I will ask you.

(Whereupon, at 3.45 o'clock p. m., the committee adjourned subject to the call of the chairman.)

AIRCRAFT PRODUCTION.

TUESDAY, AUGUST 6, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at the call of the chairman, at 3 o'clock p. m., in the committee room, Capitol, Senator Harry S. New presiding.

Present: Senators New (acting chairman) and Reed.

The CHAIRMAN. The committee will be in order, and we will first hear Mr. Potter.

STATEMENT OF MR. WILLIAM C. POTTER, ASSISTANT DIRECTOR, BUREAU OF AIRCRAFT PRODUCTION.

Senator NEW. Will you please state your name and your position?

Mr. POTTER. Assistant director of the Bureau of Aircraft Production.

Senator NEW. How long have you occupied that relation to the board, Mr. Potter?

Mr. POTTER. Since the appointment of the Director of Aircraft Production.

Senator NEW. The committee desires to interrogate you a little concerning the production program of the department, both in reference to past accomplishments and future prospects. What program has the Aircraft Production Department made for the future?

Mr. POTTER. For the next 12 months we have a program which is based upon the cabled reports from Gen. Pershing, dated some time in June. I believe that is the date. That calls for a very large number of planes and engines, and the things that go on them, and we, in turn, cabled Gen. Pershing what we might hope to do. We did not base our hopes on the most conservative judgment of what could be done, but what we would try to do. We expressed at the same time enough doubt in our confidence of being able to accomplish all that we hoped to do so that Gen. Pershing would realize that we were aiming rather high and that we knew that we were aiming rather high. Now, if you want to have me give you numbers I would want to be called again and be advised of the fact that you did want numbers.

Senator NEW. We would like numbers, Mr. Potter.

Mr. POTTER. I could only give you approximations from memory, because I did not know exactly what would be wanted here.

Senator NEW. Suppose that you do that, with the understanding that you are speaking from memory and that you will have an opportunity to correct that from your tables of the department?

Mr. POTTER. How would it be, Senator, if I sent you, in writing, a copy of this thing? I might give you some figures that would be referred to later and would be misunderstood.

Senator NEW. The better plan would be for you to submit the program in writing.

Mr. POTTER. I would be very glad to do that.

Senator NEW. For purposes of the present inquiry, can you tell us approximately what Gen. Pershing's requests were?

Mr. POTTER. I think that his request covered something in the neighborhood of 25,000 airplanes between now and the 1st of next July, with their accompanying spares, their accompanying spare engines, and their accompanying spare parts, plus armaments and instruments, and all the necessary tools and apparatus that go with them. I think we stated that we might hope to get something like 18,000 to 20,000, and I want it to be understood that I am speaking from memory.

Senator NEW. By what time?

Mr. POTTER. By the 1st of July, 1919.

Senator NEW. Mr. Potter, what type of planes did that request include?

Mr. POTTER. That included, first, single-seater fighters.

Senator NEW. Can you tell us about how many, from memory?

Mr. POTTER. I think it would be better if I did not try. It would be several thousand—2,000 or 3,000. Then, second, a much larger number of two-seater fighters. Third, a very considerable number of Army observation planes; fourth, an equally large number of corps observation planes; fifth, a very large number of day bombers; sixth, 2,000 or 3,000 night bombers. Those are the principal items which were involved in Gen. Pershing's program; and, in addition to that, he asked us to do development work on two or three other types of planes which he did not expect to have delivered for some time, a rather indefinite time in the future, but wished us to do the work on them. One was a low-flying infantry-harrassment plane, armored. The other was what is known as the three-seater gunner machine, carrying at least three men and several guns. He did not ask for any special number of those, but simply asked us to go to work on them and develop them.

Senator NEW. Will you pardon an interruption right there? Did Gen. Pershing recommend any particular type of these experimental machines which you refer to as those which were not to be delivered at any particular time?

Mr. POTTER. No; he did not recommend any particular type by name, but he did——

Senator NEW. What I seek to learn is whether he expected you to design a type of plane to cover that particular line of work?

Mr. POTTER. He did.

Senator NEW. Or whether he recommended a particular type that had been already developed somewhere else?

Mr. POTTER. No, sir. In those two cases that I spoke of he did not.

Senator NEW. He wanted us to design and experiment with—in other words, to develop planes intended for that particular line of work. Is that right?

Mr. POTTER. That is right; yes, sir. Nothing that Gen. Pershing said would prevent us from taking the best results from what had been done abroad, but he left it up to us as to whether we should take the results of what had been done in France, England, and Italy—whether we should do it all here or make a combination of the two.

Senator NEW. Mr. Potter, this may be a somewhat leading question, but have we in this country aircraft engineers who, in your judgment, are capable of designing and building military planes of that character?

Mr. POTTER. That is a leading question, and I suppose that it deserves a leading answer. I think we have, but in very limited numbers, and I will tell you who I think they are. I think to-day there landed in New York an Italian, with 5 or 6 engineers and 25 workmen, by the name of Pomelio who is capable of doing that work. We sent for him, and he is here. We have in Detroit a Frenchman by the name of Le Pere, surrounded by quite a group of skilled men. My humble opinion is that he is capable of designing airplanes. Outside of those two men I personally do not know of an airplane designer in this country that I think has had the experience close to the front and in contact with the military necessities who is capable of designing by himself a successful battle plane.

Senator NEW. They are not American engineers.

Mr. POTTER. No, sir.

Senator NEW. You say that Pomelio and his outfit landed this morning?

Mr. POTTER. As far as I know.

Senator NEW. But until to-day we did not have them.

Mr. POTTER. We did not; no sir, but we did have Le Pere.

Senator NEW. As a matter of fact, is it not true that Pomelio was brought over by request of the Italian Government in order to take charge of the development in this country of the Caproni plane?

Mr. POTTER. Oh, no; he has nothing to do with the Caproni.

Senator NEW. For what purpose, then, is Pomelio intended? Is he intended to be a general designer?

Mr. POTTER. I will give you the story, and perhaps that will be the best answer.

Senator NEW. We will be glad to have it.

Mr. POTTER. Last winter in February a man by the name of Ellis, who is an attorney of the Union Pacific, and who, I believe, is solely actuated by patriotic motives, called my attention to the fact that a very prominent Italian airplane designer by the name of Pomelio would be willing to come to this country and erect a factory to build planes of his own design. After discussing the matter with the Aircraft Board, I finally recommended that we do not bring Mr. Pomelio here for the purpose of entering into commercial pursuits; but that if he would be willing to come here with his associates in the pay of the United States Government, in an advisory and helpful capacity in the designing of such types of airplanes as we should submit to

him, that we would be glad to have him come and pay him a reasonable compensation and pay his men the usual compensation for men of their character, and he is here to do that thing. We are going to put him in a shop which we have selected in Indianapolis for the reason that it has a great surrounding country where labor is fairly plentiful and good machine-shop facilities, and we are going to say to Pomelio, "Gen. Pershing has asked us for these general types of planes. Now, we will give you one or two types. Now, you design those types to the specifications asked for by Gen. Pershing and submit your drawings to our technical section in the Department of Military Aeronautics for their approval; and if they seem to suit them, we will ask you to go ahead and build several samples and see how they turn out."

Senator NEW. So Mr. Pomelio is looked to for the possible development of new types of planes?

Mr. POTTER. Yes, sir.

Senator NEW. Mr. Potter, you say Gen. Pershing asked for a number of specified types of planes?

Mr. POTTER. Yes, sir.

Senator NEW. What do you propose to supply in the way of a single-seater?

Mr. POTTER. We propose to supply for the time being an exact copy of the British S. E. 5, which was recommended by Gen. Pershing as being one of the two best types of single-seaters on the front, and we are building them now, and the first sample plane ought to be ready now to fly.

Senator NEW. They are being built at the Curtiss plant?

Mr. POTTER. Yes, sir.

Senator NEW. They are not building the Martinsyde?

Mr. POTTER. No, sir; not yet.

Senator NEW. Do you have that in prospect?

Mr. POTTER. Yes; but the Martinsyde is not ready to ship. The first sample, fitted for the 300 Hispano-Suiza engine, will be shipped to us from England some time this month. It is not done yet.

Senator NEW. I know the Martinsyde was recommended by the board of the United States officers who were sent abroad for the purpose and I wondered what had been done to carry out that recommendation.

Mr. POTTER. Every one of their recommendations has been acted upon and the first sample of the Martinsyde plane for the Hispano-Suiza will be shipped in August, and three more will be built as soon as they can be obtained.

Senator NEW. What in the way of a two-seater fighter?

Mr. POTTER. We have two samples of the actual English Bristol fighter, which is supposed to be the best two-seater fighter that we know of, recommended by Gen. Pershing. We have them both equipped with 300-horsepower Hispano-Suiza engines, and, to the best of my knowledge, they are in the hands of the testing squadron of the department of military aeronautics now.

Senator NEW. Where?

Mr. POTTER. At Dayton.

Senator NEW. And if found satisfactory, that machine is to be adopted and put into production; is that correct?

Mr. POTTER. Yes, sir.

Senator NEW. Then that is not the same type of Bristol fighter that was produced in some quantity and recently abandoned by the Government?

Mr. POTTER. Most decidedly not.

Senator NEW. Mr. Potter, I would like to have you tell us in your own way what, in your judgment, was responsible for the failure of the Bristol fighter.

Mr. POTTER. To give you the gist of it first; lack of experience and knowledge of the science of aeronautics on the part of the men who were——

Senator REED. You speak of building the real Bristol fighter in this country. What kind of a motor will be used in it?

Mr. POTTER. First, the 300 Hispano-Suiza engine. Secondly, possibly the 8-cylinder Liberty engine.

Senator REED. When did you conclude to go to manufacturing them again?

Mr. POTTER. Quite recently—provided both those engines, or either of them, should prove satisfactory on sample tests in battle planes submitted to the Department of Military Aeronautics.

Senator REED. When you say that you are going to build the real British Bristol the question is still open of a new motor for it; that is, a more powerful motor—the Hispano-Suiza—and that is still a matter of experiment whether that will work just right or not.

Mr. POTTER. That is correct.

Senator REED. Why do you not put in the same engine that the British use?

Mr. POTTER. Because we have not got it.

Senator REED. What is that?

Mr. POTTER. They put in several motors. They put in the Sunbeam, the 275-horsepower Rolls Royce, and several other motors.

Senator REED. Why can not those motors be produced here?

Mr. POTTER. They can.

Senator REED. Just one word about the 8-cylinder. Am I correct in this: That when it was first proposed to manufacture the Liberty motor it was contemplated that this motor could be used in many different kinds of machines by making the motor with a different number of cylinders; that is to say, perhaps a 4-cylinder, then a 6 or 8, and then a 12; that was the plan first, was it not?

Mr. POTTER. I think I was not here then.

Senator REED. That is your understanding?

Mr. POTTER. Yes, sir.

Senator REED. Then they abandoned all other kinds of the Liberty for the 12?

Mr. POTTER. That is correct.

Senator REED. And now we are going back again to try the 8?

Mr. POTTER. That is right.

Senator REED. Then they abandoned all other kinds of the Liberty for the 12?

Mr. POTTER. That is correct.

Senator REED. And now we are going back again to try the 8?

Mr. POTTER. That is right.

Senator REED. Do you know who is responsible for the conclusion that we should go back to the 8 and make machines of that type?

Mr. POTTER. I think several people. A number of people are. The thought was first expressed to me in cablegrams from abroad. It became very evident to me that we needed an engine in quite large quantities of lesser bulk, weight, and power than the 12-cylinder Liberty. That was brought to my attention very emphatically by the failure of the Bristol, due to too much power and weight and size. It was suggested to me by an Englishman attached to our bureau by the name of Commander Briggs, and it was concurred in by Col. Vincent, and the idea appealed to me.

Senator REED. What does Col. Vincent have to say for the abandonment of this plan of motors of a different number of cylinders, which was done while he was connected with the air service? What explanation is there for starting out with a plan, abandoning it, and then going back to it again?

Mr. POTTER. I have just told you what the explanation was for going back to it. I have heard that the reason why they abandoned it in the first place was that they first designed the 8, and it was quite satisfactory as far as I know. Then word came from abroad that the tendency was toward higher powers; that they wanted a 300-horsepower motor, and then a 400-horsepower motor, so the Aircraft Board said that the tendency is toward the higher powers, why make this little engine? So they abandoned the 8, which I think was a mistake. They could have made the 8 and they should have made the 12, too, because there is no question that one engine in an aircraft program will not do. We have to have a number.

Senator NEW. Mr. Potter, right there, was not that a fact that the production department was some time in discovering?

Mr. POTTER. I think so.

Senator NEW. That one engine was not suited to all types of planes?

Mr. POTTER. I think so.

Senator NEW. Do you not think that a part of the delay in the production of machines by this country is due to the fact that too much effort was made to make the Liberty motor serve for all purposes?

Mr. POTTER. I think that is a true statement; yes.

Senator NEW. You spoke a minute ago of the Sunbeam motor and of the fact that we have not got them in this country. Is it not true that an effort was made here a year or more ago to induce the Aircraft Board to adopt the Sunbeam?

Mr. POTTER. Yes; so I am told.

Senator NEW. That was before your connection with the board?

Mr. POTTER. Oh, yes. I have since looked into it and I can tell you some facts about it.

Senator NEW. We shall be glad to have them.

Mr. POTTER. About three months ago a gentleman by the name of Beach called on me with a very good introduction from a friend of mine and told me that he was interested in the manufacturing rights of the Sunbeam engine in the United States, and he wanted to give

them to this Government. I became interested and I sent engineers up to Toronto, in Canada, where the engine is being made, and they made a very careful examination of it and within the last few weeks have received the first sample which they could turn over to us of that engine, which is now being tested at McCook field. I will say, however, that there are many types of Sunbeam engines—several, and this type happens to be the 180 or 200 horsepower engine, whichever you wish to call it. I can not say that that engine is as good an engine, certainly no better than our 180 Hispano-Suiza which we have in production.

Senator NEW. At New Brunswick?

Mr. POTTER. At New Brunswick. The production of these Sunbeam engines, or rather the order for these Sunbeam engines, was placed with the company in Canada sometime last fall, nearly a year ago, and I think it is fair to say that they have not produced more than a handful of them since. By a handful, I mean less than 20. That is my understanding. At least at the time my engineer was here a month ago they had not produced any, and they could not even give me one until the last two or three weeks. Now, the British Government has the entire output of that factory for some months to come and I have given instructions to the Wright-Martin people to increase their production, which I hope will be accomplished by December, so we have no use for this Sunbeam engine which is being manufactured in Canada. Besides, that engine would not be sufficiently powerful to put into the Bristol fighter.

Senator NEW. My recollection is that our committee—not the present subcommittee, because it had no existence then—but the full Military Affairs Committee was informed several months ago that some Canadian company was then engaged in manufacturing Sunbeam engines, all of which were being taken by Great Britain, and they were producing it at the rate of either 100 a week or 100 a month.

Mr. POTTER. All I can say is that if you received that information it was entirely incorrect.

Senator REED. Now, on this point of one engine not being usable for all planes: Have you in mind the dimensions of the different planes, their weights, etc.?

Mr. POTTER. Do you mean could I quote them to you?

Senator REED. Yes.

Mr. POTTER. No, sir.

Senator REED. Can you furnish them to us?

Mr. POTTER. Yes.

Senator REED. I would like to have the dimensions, the spread of the wings, and the weight, for instance, of the small one-seater fighters, then of the two-seated fighters, then of the typical bombing planes, and then of the great planes like the Caproni.

Mr. POTTER. If you will make your request, Senator, to suit the both, I can give it to you very promptly. If you want them all—

Senator REED. I do not want them all. I want to illustrate why the same engine can not be used. That involves the question of the spread of the wings, the weight, and the speed.

Mr. POTTER. I have a book in my desk which I can send over to you which will give you most of the engines, types of planes with their engines, their performance, and with pictures of them.

Senator NEW. I think I asked you, Mr. Potter, if you would give to the committee your idea of the causes responsible for the failure of the Bristol fighter.

Mr. POTTER. Yes, sir; I can do that. To sum it all up: The faulty design and construction of the Bristol fighter was due entirely to a lack of detailed knowledge of aeronautical design on the part of the men who had the matter in hand. There is no question about that.

Senator NEW. Do you think that it was originally a fault of design?

Mr. POTTER. I do not think there is any question about it.

Senator NEW. Then, was that the controlling cause?

Mr. POTTER. I can not think of any other, Senator.

Senator NEW. Well, is it not true, Mr. Potter, that the Bristol fighter was very materially changed between the time it was given to the Curtiss Co. for production and the turning out of the machine?

Mr. POTTER. Yes, sir. But the design that was handed to the Curtiss Co. was so designed that it was unsafe to fly. It was not strong enough. It had factors of safety that were very low, and had to be strengthened.

Senator NEW. It called for a weight of 2,937 pounds. Is that correct?

Mr. POTTER. I would not like to certify to that weight.

Senator NEW. Do you know how many changes were made in it and the character of any of those changes?

Mr. POTTER. I know of some of them and I know a great many changes were made. Of course, I do not pretend to follow all the changes that are made in all these airplanes. I have not time. But I do know of numerous changes that were made, and I know of some of them in detail.

Senator NEW. At all events the machine that came out was not at all the machine that went in. That is correct?

Mr. POTTER. It was a heavier machine.

Senator NEW. And in your estimation the machine would not have been quite as conspicuous a failure if made in accordance with the original design as it was after the changes had been made?

Mr. POTTER. I think it would have been a much greater failure. I do not think you could have landed twice in succession with it and had a plane. We proved that on the first few planes that we built. Every one of them were crashed. The tail skid would not stand the strain. The whole rear end of the fuselage would break. The landing gear broke and everything else except the wings, and, in fact, after all this weight had been put on and added to it the factor of safety was only five and a half, which indicates that still more weight could have been added.

Senator NEW. What should the factor of safety have been?

Mr. POTTER. It will be at least six or seven on a fighter.

Senator NEW. I do not know as I personally care to go into detail as to what made the Bristol fighter a failure. It is admitted

to be a fact that it was a failure, whether that was due to the design or to the manufacture.

Senator REED. As a matter of fact you did find a very great deal of bad workmanship, did you not?

Mr. POTTER. Oh, yes; plenty.

Senator REED. So there were two things, bad design and bad workmanship. That is about enough to spoil anything if you get enough of it.

Senator NEW. Once more returning to our original line of inquiry. What has the board in prospect as an Army observation machine?

Mr. POTTER. Three planes. The Bristol fighter can be used as an Army observation plane, and is so used. We have another plane, called the U. S. D. 9, which is practically nothing more or less than the De Haviland-9 with the Liberty engine in it. Samples of it are now being flown by the Department of Military Aeronautics, and they are passing their criticisms upon it. Depending upon what they have to say about it finally depends whether we will manufacture that plane or some modification of it. Capt. Le Pere has now completed three samples of a plane with the Liberty engine in it, and at least one and perhaps two of those planes are in the hands of the Department of Military Aeronautics for tests at Wilbur Wright Field.

Senator NEW. Mr. Potter, you speak of the U. S. D. 9 as being in point of fact very definitely similar to the De Haviland-9?

Mr. POTTER. Except that it has the Liberty engine in it?

Senator NEW. That, of course, is one very material difference.

Mr. POTTER. I embodied that in my statement as a difference.

Senator NEW. Is not a considerable change of design necessary to accommodate that machine to a Liberty motor?

Mr. POTTER. I should not say that a very considerable difference in the design was necessary; but it is quite possible that quite different results will be obtained from the operation of the plane.

Senator REED. It is quite possible that quite different results may be obtained, by which you mean to say that the Liberty engine may or may not be a success in that plane?

Mr. POTTER. I mean by that that the installation of the Liberty engine may require larger gasoline capacity, greater weight of water, greater radiator weight, and changes in weight which may affect the performance of the machine, but not the design of the machine. The machine is practically the same design as the De Haviland 9 itself.

Senator REED. Is not the greater weight liable to produce the same results that you had heretofore by overloading the machines?

Mr. POTTER. That is just exactly what I say. The fact that you put more weight into the machine may give you entirely different results.

Senator REED. You may find that machine breaking to pieces.

Mr. POTTER. We may. We propose to find out before we build them.

Senator NEW. Mr. Potter, is it not a fact that the factory out there was about ready to proceed with the production of the so-called U. S. D. 9, when it was discovered that, owing to the changes made in

it, it was being subjected to a wing load of 9.6 as against one of less than 8.6 on the plane as originally designed?

Mr. POTTER. I can not corroborate the 9.6 and the 8.6 figures because I have not got them in my mind, but it is not a fact that the plane was going to be put into production before it was tested by the Department of Military Aeronautics and approved by them. There was no intention on my part or on the part of anybody else that had the authority to give the contract for the U. S. D. 9 until it was approved, if that is an answer to your question.

Senator NEW. Yes; that is an answer. Mr. Potter, the machine, however, was made, was it not—that is, samples of it were made?

Mr. POTTER. Yes; one sample was made.

Senator NEW. And it was at least intended to proceed with the manufacture of that plane. As a matter of fact, had the technical department ever been called upon to pass upon that design?

Mr. POTTER. Yes, sir; they had.

Senator NEW. Had they ever checked up those plans?

Mr. POTTER. I do not know whether they had ever checked them up or not; but in June I sent the technical department of military aeronautics all the information that I had on that plane, as well as on the U. S. D. 9A and the two forms of Bristol fighters and, I think, one other plane, inviting their attention to such figures as we had on those planes and asking them to make suggestions in regard to them. They made some suggestions and note was taken of them. Between that time and perhaps a week ago one sample, I think, of the U. S. D. 9 was made and turned over to them, and they had certain criticisms to make of the weight of it, which are being carefully analyzed and taken cognizance of, and the Department of Military Aeronautics and our department are cooperating to see if they can adjust those difficulties and arrive at a satisfactory plane. If they can not, it will not be built.

Senator NEW. At all events, as the plane stands, with the wing load that it is made to sustain in the sample which has thus far been presented, it is not a satisfactory plane?

Mr. POTTER. That is correct.

Senator NEW. There is a mistake somewhere. If the technical department had an opportunity to examine and made recommendations and failed to do so, the fault may rest with them; if not, it rests with the production department; but somewhere there has been a collapse on that? Is that correct?

Mr. POTTER. That is correct, sir.

Senator NEW. Then that eliminates it for the present from the list of Army observation machines?

Mr. POTTER. Yes; for the moment.

Senator NEW. It may be restored?

Mr. POTTER. Yes.

Senator NEW. What does that leave?

Mr. POTTER. The Le Pere and the Bristol fighter.

Senator NEW. The Le Pere is the machine designed by Capt. Le Pere, of the French service?

Mr. POTTER. Yes.

Senator NEW. He has designed that plane here since he became connected with the United States service?

Mr. POTTER. In Detroit. That is right.

Senator NEW. And it is an entirely new thing. That, I believe, has been experimentally flown, has it not?

Mr. POTTER. Oh, yes.

Senator NEW. And with fairly satisfactory results?

Mr. POTTER. So they report to me.

Senator NEW. And the true English type of Bristol fighter?

Mr. POTTER. In so far as the plane is connected with the 300 Hispano-Suiza motor in it.

Senator NEW. And that is also being experimented with?

Mr. POTTER. It is.

Senator NEW. You say two samples of them have been made?

Mr. POTTER. Yes; sent to the Department of Military Aeronautics.

Senator NEW. Where will they be made?

Mr. POTTER. Samples are being made at the McCook Field from copies of the actual English planes.

Senator NEW. One of those machines will probably be selected as the type of Army observation plane?

Mr. POTTER. I think so.

Senator NEW. It is hoped that one of them may prove so satisfactory as to warrant your adopting it?

Mr. POTTER. Yes.

Senator NEW. What for—a corps observation machine?

Mr. POTTER. Either one of those two planes would serve for a corps observation plane with slightly different equipment on it. They would serve for an army observation. They would serve for a corps observation plane differently equipped.

Senator NEW. I would naturally so infer; but the two are separated here in these recommendations, and I therefore assumed that a different plane might be contemplated for one use than what would suffice for the other.

Mr. POTTER. If the U. S. D. 9 could be made satisfactory as to weight it would probably be a slightly more serviceable plane than either of them for corps observation.

Senator NEW. Mr. Potter, what has the department in the way of a day bomber?

Mr. POTTER. The only plane that we have in prospect for a day bomber, outside of the De Haviland 4, which is now being built, and which is found to be perfect, is the U. S. D. 9A, which is in the same stage of development as the U. S. D. 9, but I understand that an analysis of its weight and the report on its flying tests by Col. Samphill, a very well-known technical flyer, lead me to believe that the combination is somewhat more satisfactory than the U. S. D. 9. It is the same plane as the U. S. D. 9 to all intents and purposes, except that it has larger wings, and Col. Samphill, who was here with Gen. Brancker recently, flew the plane twice. The last time he flew it he said, "It is all right. Go ahead and build it," but that does not relieve us sufficiently of the responsibility, and we will not build any of them except samples unless they are approved by the Department of Military Aeronautics.

Senator NEW. What in the way of a night bomber?

Mr. POTTER. We are shipping now parts already fabricated of the Handley-Page. We have shipped 20 sets of parts up to to-day, and we have a factory in England to put them together.

Senator NEW. Where are those parts fabricated here?

Mr. POTTER. They are fabricated in a good many places. The wooden parts in Grand Rapids and the metal parts are largely made in Ohio, but some of the metal parts, like axles and other special features of metal parts, are made in several different places, and are brought together at the Standard Aircraft Co.'s works in Elizabeth, and are there assembled in sets and shipped abroad for assembly in a large plant which has been erected for the purpose in England.

Senator NEW. You say assembled in sets. Does that mean that they are set up as a completed machine?

Mr. POTTER. Only one out of fifty.

Senator NEW. Only one out of fifty is set up as a completed machine?

Mr. POTTER. Yes.

Senator NEW. Is that a sample to be test flown over here?

Mr. POTTER. Yes.

Senator NEW. Before shipment abroad?

Mr. POTTER. Before shipment of the plane itself?

Senator NEW. Yes.

Mr. POTTER. It is not intended to ship these planes abroad except in parts.

Senator NEW. I understand; but before a shipment of the parts?

Mr. POTTER. No, sir; we are shipping the parts now, and we have only completed one plane, which is being retained at Elizabeth to use as a model, and the second plane is approaching completion and will be tested and flown by the department of military aeronautics.

Senator NEW. That is being produced at Elizabeth?

Mr. POTTER. Yes.

Senator NEW. Can you give us some idea of when you think those Handley-Paige parts may be assembled in England for use as completed planes?

Mr. POTTER. No, sir; I have no way of giving you any estimate that would be of any value to you.

Senator NEW. You can not say whether it will be 90 days, 6 months, or you can not fix the time at all?

Mr. POTTER. I have not really any better basis to judge from than you have except I am told they are already ready for them and have skilled workmen to put them together, and judging from our experience here, I think that from the time that they actually arrive at the factory they should be finished inside of 90 days thereafter. but how long it will take them to go over there, or how long they will lie around the docks, or how long it will take to get them to the factory I have no idea.

Senator NEW. The element of doubt enters into that so that it is only a guess?

Mr. POTTER. Yes, sir.

Senator NEW. Reference was made a little while ago to the De Haviland 4. We are all very much interested at present in the De Haviland 4. You said that it was found to be unsatisfactory?

Mr. POTTER. Yes, sir.

Senator NEW. What we want to ascertain here is just how unsatisfactory the De Haviland 4 plane is. How many of them have been produced to date, say to August 1?

Mr. POTTER. Over 1,000.

Senator NEW. About a thousand?

Mr. POTTER. Just about a thousand.

Senator NEW. All at the Dayton-Wright plant except half a dozen or thereabouts?

Mr. POTTER. I think a little more than that, but a few have been produced at the Standard Works and a few at the Fishers, but practically the full thousand have been produced at the Dayton-Wright factory.

Senator NEW. How many of those 1,000 planes have been submitted to actual flying tests?

Mr. POTTER. I can not answer that question, but a very considerable number.

Senator NEW. How many of them have been sent abroad, Mr. Potter, up to August 1; how many have been shipped?

Mr. POTTER. I think that up to August 1 about 700 had been freighted. By that I mean actually on the water.

Senator NEW. You do not know how many have been delivered to the other side?

Mr. POTTER. No, sir.

Senator NEW. Can you tell us whether you have any information as to whether any of those machines have been put into actual use on the other side? I do not mean flown as we see machines flown about Washington.

Mr. POTTER. You mean on the line?

Senator NEW. On the line; yes.

Mr. POTTER. I received a cablegram perhaps a week ago indicating that none of them had been put on the line.

Senator NEW. What was the reason for that?

Mr. POTTER. It did not give any reason.

Senator NEW. Would it be fair to ask from whom that cablegram came?

Mr. POTTER. I suppose I am here to answer any questions you want to ask me.

Senator NEW. I want to ask you that question.

Mr. POTTER. It came from Gen. Pershing.

Senator NEW. What did he say was the reason for it?

Mr. POTTER. He did not give any, and I did not ask him.

Senator NEW. Was there not a previous communication from Gen. Pershing some time along in June enumerating a considerable number of faults in the De Haviland 4 plane?

Mr. POTTER. Yes, sir.

Senator NEW. And did not this cablegram at that time say that those machines could not be used or would not be used at all until after they had been put in different condition?

Mr. POTTER. I am just trying to think whether he said that or whether he said the synchronizers could not be used until they had been put into different condition.

Senator NEW. It did not say that. We have a copy of that report.

Mr. POTTER. I think he said that the synchronizer was the thing that could not be used until it was put into different condition. He may have said that about the plane, but I think not.

Senator NEW. Referring to this last cablegram, you said that Gen. Pershing said a week ago that none of these machines were in operation on the front?

Mr. POTTER. Yes, sir.

Senator NEW. Did he state why?

Mr. POTTER. No, sir.

Senator NEW. He did not give any reason for it?

Mr. POTTER. No, sir.

Senator NEW. Was there just the cablegram?

Mr. POTTER. No, sir. This was in reference to one I sent him asking if any De Havilands had been put on the front; and if any, what had been their performance, and he said: "No; we expect to have an answer for you soon" or something of that kind, but I did not ask him why, because I could imagine why.

Senator REED. What did you think was the reason?

Mr. POTTER. Because they had to be gotten ready; certain changes had to be made in them, and he had to get his pilots used to them.

Senator REED. But these machines that were sent over there contained the very same defects that had been specified in a previous letter as making the machine unfit for use?

Mr. POTTER. Certainly.

Senator REED. So, then, it is not a question of the training of the flyers, but a question of having the planes for the flyers?

Mr. POTTER. I said so, exactly, that he would have to change the planes.

Senator NEW. The point I was trying to establish was that the first cablegram enumerated a number of faults with the planes, and that since those faults were set forth in that cablegram many others had been sent over containing those same defects?

Mr. POTTER. Some had and some had not. I mean all of the planes sent over contained some of the defects, and some of the planes did not contain all of the defects. We have been correcting them and have been trying to correct them as fast as we could.

Senator NEW. Some time ago the Navy took 155 of those planes, did it not—the De Haviland fours.

Mr. POTTER. Yes, sir.

Senator NEW. Somewhere around 50 of them were shipped abroad. I believe, for the Navy's use, to an address designated by the Navy authorities?

Mr. POTTER. That is correct.

Senator NEW. About 100 others were crated up and delivered to the docks for shipment, were they not?

Mr. POTTER. Yes, sir.

Senator NEW. Is it not true that about that time, concurrent with this, 4 of the lot of 155 were sent to the flying field of the Navy at Miami, Fla., and there submitted to tests?

Mr. POTTER. Yes, sir.

Senator NEW. Is it not true that the commandant of that flying field, Capt. McCaughtry, made a report to the effect that the ma-

chines were unsatisfactory and that they ought not to be flown and could not be flown in the condition in which they were delivered down there to that field?

Mr. POTTER. I received a report, the contents of which emanated from the officer you speak of, indicating a number of defects, most of which were identical with the defects found by Gen. Pershing. As far as I can remember, the report that I received was signed by Commander Atkins and simply stated that these were the criticisms found.

Senator NEW. You have not seen a report filed by Capt. McCaughtry, the commandant at that field?

Mr. POTTER. If I have, I do not remember it as such.

Senator NEW. Then, of course, you have not seen paragraph 20 of the report submitted by Capt. McCaughtry?

Mr. POTTER. I think I have not seen that paragraph.

Senator NEW. That was the particular paragraph of the report that I had in mind when I asked that question. Following that up, Mr. Potter, is it not true that the 100 machines which had been crated and delivered to the Navy for shipment abroad were turned back upon the Aircraft Production Board?

Mr. POTTER. Yes, sir; it is.

Senator NEW. Where are they now—in Dayton or en route there?

Mr. POTTER. They are either at the port of embarkation, all or part of them, or part of them are on the way back to Dayton.

Senator NEW. Can you tell us what it is proposed to do with those machines?

Mr. POTTER. Take them apart and fix them up. I mean by that, tear the wing coverings off of them, put in extra ribs, put on new wing coverings, put in better sewing, and do all things that we have to do to them to meet those criticisms.

Senator NEW. Is there an instance of the De Haviland 4 machine having been tested or submitted to the judgment of any competent authority where the report upon it has been favorable?

Mr. POTTER. I think not.

Senator NEW. As a matter of individual judgment, just how serious, in your opinion, is the trouble with the De Haviland 4 machine?

Mr. POTTER. You know what the troubles are. You have seen the list of troubles. I can not think of any of the troubles that are reported in the lists that we have as coming from Gen. Pershing and the Navy which can not be and are not being corrected but one. In the criticisms that I can remember as coming from the Navy there is one that can not be corrected. That is, they say that the view from the pilot's seat is not very good. That can not be corrected. That is inherent in the machine.

Senator NEW. I will say this, Mr. Potter: This committee in the last 10 days, or approximately that time, has had before it quite a number of practical flyers, many of them men who have seen actual service abroad, and I think with no exceptions they have passed that same criticism upon the De Haviland 4 and say that the arrangement of it is such that it is no good as a day bomber nor as a fighter.

Mr. POTTER. It is not supposed to be a fighter.

Senator NEW. As a matter of fact, isn't it?

Mr. POTTER. No, sir; it is not.

Senator NEW. I think it has been referred to both as a day bomber and as a fighter, and if it is not a fighter, where have we a fighter machine?

Mr. POTTER. I say we have none.

Senator NEW. Provided these machines can be rebuilt so as to make them at all serviceable, how long would it take to do it?

Mr. POTTER. I issued instructions last week, after a conference with the Department of Military Aeronautics' technical people, that no more airplanes, De Haviland 4's, were to be shipped or accepted from any of the factories until a list of changes which I stipulated had actually gone into effect, and which were changes which were considered by this conference, at which Col. Bane and Col. Jones and others were present, had gone into effect.

Senator NEW. Where did that conference take place?

Mr. POTTER. Here in Washington.

Senator NEW. When?

Mr. POTTER. Last week sometime.

Senator NEW. So that the production of the DeHaviland 4 machine is in a state of suspension; is that correct?

Mr. POTTER. I would not exactly say that; but it is being slowed up a little.

Senator NEW. No more of them will be turned out in the shape in which those that were delivered to the Navy were delivered in?

Mr. POTTER. Not if my instructions are carried out.

Senator NEW. And no more similar to those that have been sent to Gen. Pershing?

Mr. POTTER. The same answer, sir.

Senator NEW. This committee has been informed that following the report that was made to it by the Navy an officer—Col. Hall. I think—accompanied by a force of assistants, was sent abroad for the purpose of going over those machines and attempting to put them into condition. Is that correct?

Mr. POTTER. Yes, sir; that is correct; but it did not follow the report of the Navy. It preceded it, as far as I know. I had not seen the report of the Navy when I sent Col. Hall abroad. He was sent abroad on July 16.

Senator NEW. That is, Col. Hall who collaborated in the—

Mr. POTTER. Yes, sir; Lieut. Col. E. J. Hall.

Senator NEW. Now, do you or do you not, as a matter of fact, know that a cablegram was sent to Admiral Sims calling his attention to the defective character of the DeHaviland planes that were sent abroad by Navy order?

Mr. POTTER. I do.

Senator NEW. And warning him that they should not be used until they had been gone over.

Mr. POTTER. I do.

Senator NEW. Getting back to Col. Hall; Col. Hall is an engineer. I believe.

Mr. POTTER. He is.

Senator NEW. And I am perfectly willing to assume that he is a very good one. What type of engineer is he, mechanical or—

Mr. POTTER. Do you know his history?

Senator NEW. Not fully. I know that he is one of the brothers who designed and produced the Hall-Scott motor.

Mr. POTTER. That is correct. That is, a member of the corporation of the Hall-Scott Co., which has produced aviation motors of different types for some years. He has been more or less connected with the aviation business before the war. He is a mechanical engineer and a mechanic of considerable ingenuity, and I differentiate between his being a mechanical engineer and a mechanic, because he is both. He had a great deal to do with the designing or adoption of the design of the so-called Liberty motor. He had a great deal to do with the placing of the equipment on the De Haviland 4, much of which he did with his own hands, and he knew all the details of it. That is the best description of the type of man that he is that I can give you.

Senator NEW. I asked that question because I wanted to inquire further if Col. Hall's training was such as to qualify him to sit in final judgment on the design of aircraft, not of motors, but of aircraft?

Mr. POTTER. I think not.

Senator NEW. This committee has heard, among many other reports, that Col. Hall has said that he made something like 3,600 changes in the De Haviland 4 machine from the time it entered the factory until it emerged in its present shape. Do you know anything about how many changes were made and who was responsible for them?

Mr. POTTER. I have not the faintest idea how many changes were made, but I think Col. Hall did make some changes in the De Haviland 4 in detail, but those changes, to the best of my knowledge, were not fundamental changes; they were of guns, gun sights, and instruments, shell chutes.

Senator NEW. As a matter of fact, at somebody's instance, either wisely or unwisely, a very considerable number of changes were made in the design of the De Haviland 4 machine before it was put into production. Is that not so?

Mr. POTTER. I presume that a large number of changes were made, though some of them were as unimportant as the substitution of a cotter pin for a set nut, or something of that kind.

Senator NEW. However, is it not true that there were many important changes made?

Mr. POTTER. If so, I am not aware of it.

Senator NEW. Is it not true, however, that the De Haviland 4 machine, as it stands to-day, is a very unsatisfactory plane?

Mr. POTTER. It is quite unsatisfactory to everybody, I think—not to everybody. There are some few men who say it is pretty good.

Senator NEW. Can you tell this committee how long it will be, in your estimation, before we are able to put an acceptable machine of American manufacture in actual combat on the front?

Mr. POTTER. No, sir.

Senator NEW. You can not answer that question?

Mr. POTTER. No, sir.

Senator REED. Will you tell us why you can not give us an estimate of that, Mr. Potter?

Mr. POTTER. In the first place, we will say that the first few machines that have been designed, readapted, and made in this country have been unsatisfactory, therefore we have not got any satisfactory machine to-day. Secondly, in order to make a satisfactory machine and put it on the front it has to pass to the satisfaction of the technical section of the Department of Military Aeronautics. I can not tell whether they are going to find these various designs satisfactory or not. They have not found any that are satisfactory yet. I do not mean to say that as any criticism upon them, because I do not think it is. I can not tell, nor can anybody else, whether they will find these things satisfactory or not, and after that they have to be built and have to be shipped and put on the front. Therefore, I can not estimate it. The machine that is to be satisfactory to the Department of Military Aeronautics has yet to be built.

Senator REED. Has yet to be created?

Mr. POTTER. You might use that word; yes.

Senator NEW. Mr. Potter, in view of those facts, is it not true that it will be at least some months?

Mr. POTTER. I think so, unless the faults of the De Haviland 4 can be corrected so it will be satisfactory, otherwise it will be some months.

Senator NEW. Under the generic term I included day bombers and all machines that are to be used in actual combat, everything other than training planes.

Mr. POTTER. That is what I thought you meant. I may say this, in further explanation of my estimate, that it is quite possible that we may have some single seater fighters that will be satisfactory in a very reasonable length of time, but whether they actually will be satisfactory or not I can not tell.

Senator NEW. What are those?

Mr. POTTER. The S. E. 5's. If they are not satisfactory, I do not think anything ever will be, because they are an exact copy of the English single-seater fighter, with an almost exact copy of the same engine.

Senator NEW. How long is it going to take to get into quantity production of those?

Mr. POTTER. They tell me about 60 days.

Senator NEW. What do you mean by quantity production?

Mr. POTTER. I mean several hundred a month.

Senator REED. Let me summarize this thing, if I may. As a matter of fact, you have not yet developed or put upon the battle front a successful fighter, a successful day bomber, or a successful reconnaissance machine?

Mr. POTTER. That is correct.

Senator REED. And we have not put on a successful heavy, or night, bomber?

Mr. POTTER. That is correct.

Senator REED. And we have not yet made any of these machines that we can say with any degree of certainty will be a success?

Mr. POTTER. That is correct.

Senator REED. We have expended or committed ourselves to expenditures of about how much?

AIRCRAFT PRODUCTION.

1101

Statement of obligations and net expenditures of aircraft production and Signal Corps (old) appropriations as of May 31, 1918, and July 31, 1918.

Appropriation.	Amount of appropriation.	Allotments as of May 31, 1918.	Expenditures as of May 31, 1918. ¹	Allotments as of July 31, 1918.	Expenditures as of July 31, 1918. ¹
Air service production, 1919	\$760,000,000.00	.....	.....	\$38,137,795.21	\$9,011,925.00
Increase for aviation, Signal Corps, 1918.....	640,000,000.00	\$661,248,815.71	\$281,355,494.17	714,091,950.72	366,371,836.82
Signal service of the Army:					
1918.....	51,800,000.00	51,099,375.93	17,789,856.58	51,796,754.12	20,167,617.62
1917-18.....	47,267,766.00	45,500,082.48	39,979,438.83	47,327,912.28	41,030,589.30
No year.....	4,500,000.00	4,333,495.57	4,225,000.00	4,333,484.59	4,475,000.00
Maintenance, etc., fire-control installations:					
Seacoast defenses.....	141,339.43	80,906.59	129,667.15	94,885.47	140,667.10
Seacoast defenses, insular possessions.....	12,506.58	10,981.26	9,721.77	12,078.42	10,786.46
Seacoast defenses, Panama Canal.....	10,650.68	9,326.26	10,525.68	9,334.12	10,525.68
Fire control:					
In insular possessions..	12,834.38	4,251.59	10,196.68	11,238.48	11,496.68
At fortifications.....	16,025.90	8,826.94	7,348.80	10,826.94	7,698.80
At fortifications, act June 15, 1917.....	446,761.96	191,565.01	333,988.04	213,610.47	349,550.00
Washington-Alaska military cable and telegraph system, 1918-19.....	50,000.00	49,904.22	49,305.75	49,905.00	49,905.00
Contingent expenses, seacoast fortifications, act June 15, 1917.....	51,038.68	46,573.30	29,869.05	46,573.30	49,000.00
Board of Ordnance and Fortifications.....	15,088.43	689.13	23,793.65	689.13	13,254.09
Aviation seacoast defenses.	2,839,010.98	21,407.12	24,511.14	21,407.12	24,511.14
Insular possessions,					
Hawaii.....	438,677.97	84,445.00	52,509.70	84,445.00	52,509.70
Insular possessions, Philippines.....	578,110.36	2,078.66		2,078.66	
Panama Canal.....	500,000.00	482,000.00		484,000.00	485,739.00
Supplies, services, and transportation, etc.:					
1918.....	16,882.73	15,000.00	.....	15,000.00	15,000.00
1917-18.....	100,000.00	.....	.....	100,000.00	100,000.00
Ordnance and ordnance stores, Bureau of Ordnance, 1917-18.....	9,600.68	1,086.00	.....	1,086.00	1,086.00
Aviation, Navy, 1917-18...	350,000.00	350,000.00	333,000.00	350,000.00	350,000.00
Signal equipment, Enlisted Reserve Corps, 1918.....	300,000.00	300,000.00	295,000.00	300,000.00	300,000.00
Commercial telephone service at Coast Artillery posts, 1918.....	13,500.00	13,500.00	13,416.00	13,500.00	13,500.00
Replacing Signal Corps supplies and equipment:					
1917-18.....	136,918.43	136,328.09	123,360.50	136,283.34	133,589.86
1918-19.....	361,954.21	124,944.23	125,000.00	124,944.23	124,383.70
Total.....	1,509,968,667.40	764,115,582.09	345,406,742.49	857,769,782.60	443,300,171.95
Increase for aviation, Signal Corps, 1918 (apportionment, 525 materials for resale).....	.....	2175,772,585.02	211,161,708.00	2187,565,392.93	219,001,862.69
Grand total.....	1,509,968,667.40	939,888,167.11	334,245,034.49	1,045,335,175.53	424,298,309.26

¹ All advance payments have been deducted from expenditures as of May 31, 1918, and July 31, 1918.

² These allotments include orders and authorities for material, etc., purchased by the Bureau of Aircraft Production for resale. A portion of this amount, to be later determined, will be an allotment against the appropriation "Increase for aviation, Signal Corps, 1918."

³ All uncollected payments on "sales department" allotments are deducted from expenditures as of May 31, 1918, and July 31, 1918.

HAROLD MCLEHMAN,
Captain, A. S., A. P.,
In Charge Appropriations Department.

Approved :

C. C. CAMPBELL,
Major, A. S., A. P.,
Executive Officer, Finance Division.

WASHINGTON, D. C., August 15, 1918.

Senator REED. Please tell us the amount of money that has been expended or that the Government has become obligated to expend in the production of aircraft. I mean by this how much money it would take for the Government to settle up to-day if it was going to step out of the business; and in that connection please give us the amount of money that has been lost on the Bristol fighter, which has been condemned; the amount of money that has been lost or expended on the Standard J machine, which was thrown out; and the amount of money that has been expended or lost on the De Havilland 4, assuming now that all of these machines are worthless, and then give us, if you have any figures upon which you can base an estimate, your best estimate as to what, if any, salvage there may be in each of these kinds of planes, respectively; and if you can not give anything but a mere wild guess, just merely state that fact.

Senator REED. You have stated, Mr. Potter, a very fundamental fact, that the lack of success in these planes is due to a lack of knowledge of the design, chiefly, and in addition to that there is imperfection of construction, etc., and you also stated that you had now an Italian expert here, Mr. Pomelio, who is about to undertake the designing of planes in which the Liberty engine could be employed, if I understand you right.

Mr. POTTER. Other engines as well.

Senator REED. You, therefore, recognize the wisdom of utilizing the services of genuine aeronautical engineers?

Mr. POTTER. I do.

Senator REED. I think that is indisputable. Now, will you tell me why it is Caproni sent over the experts who had been the controlling end of his great factories, Capt. De Annunzio, and sent over some other men, why they have been practically marooned down here on Long Island and left there and have not been placed in charge of factories engaged in the production of that machine?

Mr. POTTER. That is not a fair statement. I have to take exception to that. Capt. De Annunzio came here and was welcomed and every possible facility that I know of was given him to build his machines. No limit was put on him on what he could or should do, and the experimental ship of the Standard Aircraft Co. at Elizabeth, N. J., was turned over to him and he built a machine which is now at Mineola and has been in the air. It is true he has not been turned over a factory to build large numbers of these planes because he is not ready to do it. He was given carte blanche to get up drawings—his drawings are not finished yet—that plane which he has at Mineola is not finished yet. He is not willing that it should be tested by American flyers, and, unfortunately, the two Italian flyers of the Caproni machines were killed. Other Italian flyers are now on the way. Mr. De Annunzio has not been marooned anywhere.

Senator REED. That is my expression.

Mr. POTTER. I take exception to it. I want to lean over backwards and not say anything that is not so, and on the other hand I want to give ourselves justice. Mr. De Annunzio has been given every facility that the United States Government offers to develop his machines.

Senator REED. When was he given those facilities?

Mr. POTTER. As soon as he came here, which was, to the best of my knowledge, in February. If there is any facility which he has not been given, I do not know what it is.

(At this point informal discussion took place outside of the record.)

Senator REED. In view of the fact that it is your opinion that aeronautical engineering talent ought to be employed and that the fault lies in the design, why is it that the men who have made a reasonable success at making airplanes have not been requisitioned and their talent employed instead of the talent of a lot of automobile men and carpenters and fellows of that kind for the purpose of designing?

Mr. POTTER. As a matter of fact, their talent has been availed of, but I think that the reason why those men are not in the Government employ is that they can not afford to be in Government employ. You will find, Senator, that most all the men who are in the employ of the Government, giving their entire time and attention to the Bureau of Aircraft Production are men who, although it is a considerable sacrifice to them, can afford to come down here perhaps and work for nothing. We have endeavored on several occasions to enlist the services of aeronautical engineers. I prefer not to mention any names, but those men have not found that they were able to do it.

Senator REED. Then, why are they not paid a sufficient sum so they can come? Here is the loss of millions of dollars because of incompetency. Under such circumstances, how much any expenditure would be preferable to the waste of this time and money and the tragic situation on the western front?

Mr. POTTER. You probably know it is rather difficult to arrange salaries in the War Department.

Senator REED. The executive department has not asked Congress for a single power that has not been granted, except one relating to the press. There is not a question about the fact—and there has not been a question, in my opinion, for many months—that if you or Mr. Ryan or your predecessors were to say to Congress that you had to have some experts to plan these planes, and that you could not get them without paying large salaries, that you would be granted that permission; and I am asking now whether the way out of this difficulty is not to summon to your aid the men who have been able to produce practical airplanes; the best constructive talent there is, and surround yourselves with that sort of talent and let it plan the machines?

Mr. POTTER. That certainly will help.

Senator REED. Why are we to stop short of that? Let a board or commission of that kind, or, what is better than that, in my judgment, a body of engineers, working under the general direction of some head, and then after they have conceived the machine, let the practical manufacturer produce it. In other words, put the construction and the designing ahead of the production proposition. Why is not that the right thing to do?

Mr. POTTER. I think it is.

Senator REED. Now, what is being done to have it brought about, Mr. Potter?

Mr. POTTER. As I said to Senator New, that is just one of the things we are trying to do. We are inviting Italian designers to

come to this country. We have already invited and have here with us French designers. We have sent over to England for some of their best technical men. We have a man abroad to study foreign types, and we have several airplane designers with them. I hope they will come back with new ideas, but all these things take time.

Senator REED. In addition, however, to sending men abroad, why is it that men who have successfully built flying machines in this country are not called in?

Mr. POTTER. They are.

Senator REED. We have had complaints made to this committee by men who have been building machines that they can not even get orders for machines.

Mr. POTTER. That is right, they can not. Too many orders have been given for machines already to Tom, Dick, and Harry, and they have produced miscellaneous types of machines, not one single one of which has been any good up to date.

Senator REED. There has not been a single one of those that the Government has been spending a billion on that has been any good, but that is no worse than spending the money on experimental machines.

Mr. POTTER. Well, the Government has only tried to build two machines in actual production. I suppose that if I could count up the list of experimental machines that had been ordered by the Government, none of which are of any service, it would run into the hundreds. We have adopted lately the following scheme: We get our requirements from abroad in performance and type and we submit those requirements to various airplane designers who are asked to build certain numbers of machines on that basis. They submit designs first, and the designs are gone into by the Department of Military Aeronautics to criticize and offer suggestions, and if they are finally accepted, an airplane designer is asked to build five or six samples of the machine. You can not give a vast number of these orders out because we have only certain types that are desired by the Army.

Senator REED. Why have not the piano makers and other manufacturers of wood which required a high knowledge of fine woodwork and cabinet work; why have they not been called in for the purpose of doing some of this manufacturing of those parts, particularly that require great strength and lightness at the same time?

Mr. POTTER. Furniture people have been called in.

Senator REED. I am not speaking of the furniture people. I am speaking of these people that——

Mr. POTTER. Some piano manufacturers have been called in to make propellers, but, as you know, we have ample airplane manufacturing facilities in this country. We have more than we can fill up at the present time.

Senator REED. You have people who have been doing work some of which has been described here, and I am hesitating because I can not see how a human being can do the kind of work that has been described here in some instances.

Mr. POTTER. Our principal orders are with airplane factories.

Senator REED. That depends on what we call an airplane factory, of course. The Curtiss we call an airplane factory and yet we have me very bad work from there.

Mr. POTTER. Yes; and also some very good work from there.

Senator REED. What good work?

Mr. POTTER. The Curtiss training planes, of which they have made thousands, and the Navy has had very good work on their boats, so they tell me.

Senator REED. Would you call the Dayton-Wright factory in Dayton an airplane factory?

Mr. POTTER. They had a little airplane factory before they built the large one.

Senator REED. That was practically built for the purpose of manufacturing airplanes. You would call the Fisher Body Corporation an airplane factory?

Mr. POTTER. No, sir; but they do wonderful work.

Senator REED. What I am coming to is this, the question of inspection. Why is it that you can not get enough competent inspectors so that this bad work which has been described can be prevented? That is why I suggested cabinetmakers. I suggest utilizing men who can make pianos and musical instruments, etc., as inspectors.

Mr. POTTER. I think that is a very good suggestion.

Senator REED. That is not original with me. That suggestion has been made here by witnesses some of whom are flyers and some of whom were engineers. Why is it that you do not keep and have on your staff when it comes to the question of the planning of these machines some of the best flyers our country or other countries have developed, so that they may point out in advance points of weakness? I am going to illustrate that. Here comes in a young fellow who has had three years over there fighting, and has been in command of 40 or 50 airplanes, who sits down here and proceeds to tell us out of his head the defects of a certain machine. He has never flown in it, and yet he tells those defects as accurately. It seems to me, as they have been told by all of the engineers who have been here, and because evidently he gained by his practical experience. Why is it that those men are not brought in?

Mr. POTTER. Those men are not under our control.

Senator REED. You can get them.

Mr. POTTER. Well, I do not know whether you can get them or not. We have tried to get them.

Senator REED. If you can not get them there is something wrong about the whole organization.

Any organization that will proceed to produce airplanes without availing itself of the talent that the country possesses has some defect in the organization. It may be due to the law or any one of many causes, but, whatever those causes are, we ought to get rid of them, should we not?

Mr. POTTER. We should; yes.

Senator REED. I am asking you more by the way of suggestion than anything else why is it that there men who know what makes the strain on the plane—who know it practically from being in the air with them—should not be about and around and consulted before planes are put into production and as they are put into production. So that they can point out the weaknesses?

Mr. POTTER. The answer is, of course, that they should be.

Senator REED. Then I hope they will be. There are a number of these defects on these machines that came from bad workmanship. I am not asking you now about the defects in the planes that may or may not be the fault of the manufacturer, but when it is the result of bad workmanship who stands the loss?

Mr. POTTER. The United States Government.

Senator REED. That is to say, if the United States Government has the Curtiss Aircraft Co.—I will just use them for an example—or the Dayton-Wright Aircraft Co. make 100 machines and finds out that all of those machines are defective, the Government stands the loss?

Mr. POTTER. Yes, sir.

Senator REED. Do those people still get their percentage upon this bad work?

Mr. POTTER. They do.

Senator REED. Do you regard that as businesslike or fair?

Mr. POTTER. Well, Senator, that depends. If the Government gives an airplane manufacturer an order—if it is bad workmanship—no; it is not right. But if we permit bad workmanship through faulty inspection, it is our fault.

Senator REED. No; it is a fault. I agree with you that the Government inspection is a means provided to keep a scoundrelly manufacturer from putting over a fraud on the Government, and if we are sufficiently alert we can protect the Government; but if never inspected at all, we still have the right to expect good workmanship and honest dealing. I must insist upon that as the principle of it all. So that, summing this thing up in all this vast amount of work, the aggregate of which you have not as yet given us in dollars and cents, has proven worthless thus far. These gentlemen who have been producing this work will fare just as well in dollars and cents as if they had produced first-class work.

Mr. POTTER. They will.

Senator REED. I now suggest a criticism of the Aircraft Board for the first time. It is that that sort of contract should not be written again.

Senator NEW. Mr. Potter, Senator Reed just made a reference to the inspection. Are you satisfied with the character of the inspection that has been had?

Mr. POTTER. No.

Senator REED. Do you think that that has been in certain instances, at least, very defective?

Mr. POTTER. Yes.

Senator NEW. What steps are being taken to remedy that?

Mr. POTTER. We are constantly trying to get better men and constantly trying to improve the organization and using every effort that we can to make our inspection more efficient.

Senator NEW. I strongly suspect myself that the one great difficulty in that is the inability of the Aircraft Board or anybody else to find men who are competent as inspectors.

Mr. POTTER. Why, certainly. It is a matter of education, and another cause for some very inferior personnel is the limited salaries we are permitted to pay to our inspectors.

(Whereupon, at 5.45 o'clock p. m., the subcommittee adjourned to meet at 2.30 o'clock p. m., on Thursday, August 8, 1918.)

AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 8, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 2.30 p. m. in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), New, Frelinghuysen, and Reed.

The CHAIRMAN. The committee will now resume the hearing. Mr. Nash, we will hear you first.

STATEMENT OF C. W. NASH.

Senator New. Please state your name.

Mr. NASH. C. W. Nash.

Senator New. Your present position with the Aircraft Production Board?

Mr. NASH. Assistant to the director in charge of engineering and production.

Senator New. What was your business before you came to the board, Mr. Nash?

Mr. NASH. President and general manager of the Nash Motors Co.

Senator New. How did you happen to take service with the Aircraft Production Board?

Mr. NASH. At the very urgent request of Mr. John D. Ryan.

Senator New. Is it a fact that you were more than once solicited to come to the board?

Mr. NASH. Yes, sir.

Senator New. State to us some of the efforts that were made to induce you to come?

Mr. NASH. I think perhaps within a week after Mr. Ryan was appointed to the position that he now occupies he wired me at Kenosha to know if he could see me at Washington or New York at an early date. I replied that I would be in Washington in a week. I went there, and I called upon him, and he explained to me that he had taken hold of this very troublesome problem and wanted to know if I would not come and help him out. I replied by saying that I would investigate the situation and would make a decision. I went to Detroit and made a little investigation and talked with some of my friends, and after a few days I wrote him that I did not feel it was possible for me to do it under the conditions; that

I did not feel that I would be of enough service to him to warrant the undertaking.

Senator NEW. Mr. Nash, were you influenced in that by the conditions that you discovered as existing in the organization?

Mr. NASH. Yes, sir; I was.

Senator NEW. State just what your impressions about it were and why you hesitated to take hold of it.

Mr. NASH. I felt that the situation had been very badly handled from the start; that there was not any organization that you could start to build on; that it would be necessary to begin back pretty near to the foundation and build up if you were to handle this matter in a manner that would be a credit to yourself, to the industry, and to the country, and I felt that I would be handicapped perhaps to such an extent that I could not go ahead and build up the necessary organization to make a success of the aircraft production, and for that reason I wrote Mr. Ryan that I did not feel that I could undertake it.

The CHAIRMAN. How long ago was that?

Mr. NASH. If you know the date on which Mr. Ryan accepted the position—within a week, about two weeks after he had taken the position. To continue, I suppose perhaps a matter of three weeks may have elapsed when I received a call from Col. Mixer, wanting two friends and myself to meet him at the Blackstone Hotel in Chicago. I did not know what his wishes were and why I should meet him, but he explained that he was there to get me to reconsider my decision.

The CHAIRMAN. Tell us who Col. Mixer is and what his relation to the aircraft activities was at that time?

Mr. NASH. My understanding was and is now that he was assistant to the Chief of the Production Section, who was Mr. Landon. Col. Mixer explained the condition that the aircraft service was in, and after discussing it at some length he remarked that he thought I knew more about how bad it was than he did. I told him at that conference that I would reconsider to the extent that I would go to Detroit and look into what was being done there and to Dayton, Buffalo, and then on to Washington. I left Chicago on the 2 o'clock train, and when I arrived at my office in Kenosha there was a telegram on my desk saying that Mr. Ryan would be in Detroit on the next Tuesday and desiring that I meet him there and go from there to Dayton with him. I went to Detroit, as I had planned, and met Mr. Ryan and visited four or five of the plants doing work, and then at Mr. Ryan's invitation accompanied him to his room in the evening, when he impressed upon me the necessity of having some help in this matter, and I agreed with him, and he put it up so strongly that I could not very well retain my self-respect and that of my friends without doing something. I told him I would look things over, and I went to Dayton and visited the McCook Field and the Dayton Wright plant and what is known as the South Field, and then came on to Washington.

The CHAIRMAN. When was that?

Mr. NASH. About the 12th of June. I returned home on the 13th of June, and I wrote Mr. Ryan what I thought was wrong with this proposition, and that if I was to undertake anything it would have

to be to set up the organization in an entirely different manner, and that if he wanted to discuss the matter further with me I would have to come to Washington, which I did; and after discussing it with him I had the assurance that I could set this organization up in any way I thought best, and that he would back me. With that understanding about two weeks ago I started into this proposition.

Senator NEW. Is it not a fact that from your investigation at that time you found that as a manufacturing proposition the aircraft business was in just about an impossible shape?

Mr. NASH. Yes, sir; it was.

Senator NEW. Do you feel at liberty to state just what you said to Mr. Ryan; what recommendations you made for changes?

The CHAIRMAN. Perhaps we should say to Mr. Nash that the purpose of this meeting has been to have Mr. Ryan come before us when we had virtually completed the taking of testimony, but at about that time Mr. Ryan went away, quite unexpectedly to the committee.

Mr. NASH. I said to Mr. Ryan that, in my judgment, if this thing was to be made a success it would have to be—that the three branches of the business would have to be coordinated and organized under one head.

The CHAIRMAN. What three branches?

Mr. NASH. The technical section of the military aeronautics, the engineering department of the aircraft production, and the production department, and that he would have to select a competent man to head that; and, if I was to be the man, that I would have to sit in when the program was made up as to what was required in the way of airplanes, and it would be up to me to make the investigation and report whether it was possible to carry out what would be desired or not.

Senator NEW. To carry out what was recommended?

Mr. NASH. By Gen. Pershing, if you please. He is the man who makes the requests for what is wanted overseas.

Senator FRELINGHUYSEN. In this engineering department, the Bureau of Aeronautics, what kind of engineers are there in there? Who are they?

Mr. NASH. You are speaking now of the engineering department of aircraft production?

Senator FRELINGHUYSEN. Yes; the men who have been responsible for the numerous changes in type and design.

Mr. NASH. When you say the men who have been responsible, you are covering a pretty wide field, because everybody has assumed the responsibility and then avoided it.

Senator FRELINGHUYSEN. I mean the men who have drawn plans and designs and changed the types, changed the designs of the English models. That is a group of engineers in the aeronautical division, is it not?

Mr. NASH. Well, I would not say so.

Senator FRELINGHUYSEN. Where I have been confused is this: As I have heard the testimony there have been a whole lot of automobile-engine builders in this enterprise. The criticism which was made in the beginning was that the best engineering talent in this country, familiar with the fundamental principles of explosion engines, had not been employed; they had not been considered; their advice had

not been taken, and I was anxious to find out just who was responsible for the engineering policy of the aeronautical division. Have they engineer officers that have been changing these designs? Who has been doing it? Has it been the automobile engineers who are officers there? It seems to me, as I have stated, there should be one engineering authority to produce the best type of airplanes.

Mr. NASH. That we have now.

Senator FRELINGHUYSEN. And they should be the best engineers.

Mr. NASH. We have got together the technical section of the Military Aeronautics Division, which really is the division that says what is wanted after the information comes from Gen. Pershing and the Engineering Department of the Aircraft Production Board, and they will be located in one central building at Dayton, Ohio. They will go over the requisitions for different types of planes and together will decide as to what is the best method to pursue in accomplishing what is wanted. After they have reached an agreement then there will be built either at McCook Field or at some other engineering place, or by some airplane makers in the country, four samples of any type of machine that it is decided we should build. One will be turned over for sand test, the other will be turned over to the engineering department of the Aircraft Production Division; the other two to the Military Aeronautics for final test and approval. Then, if those machines are found satisfactory, there will immediately be furnished a complete set of drawings and bill of materials and specifications covering the type of plane, and upon those the contractor or whoever is to build the plane will start to work.

Senator FRELINGHUYSEN. Have you, or are you going to get rid of the men who have been responsible for the costly mistakes and blunders?

Senator NEW. Is it not a fact that at this time it is going to be months yet before we have airplanes on the front?

Mr. NASH. Yes, sir; excepting the De Haviland 4's.

Senator FRELINGHUYSEN. Have you, or are you going to get rid of the men who have been responsible for the costly mistakes and blunders?

Mr. NASH. I do not know as that is within my jurisdiction.

Senator FRELINGHUYSEN. You have referred to the fact that you are going to have a new engineering department. Will any of the men, who have been responsible for these mistakes and blunders, be in that department?

Mr. NASH. Not knowing whether the men that you have referred to are responsible, I would not be in a position to answer that question.

Senator FRELINGHUYSEN. Would Col. Vincent, Maj. Hall, or Col. Deeds be in that engineering department?

Mr. NASH. I only know that Col. Vincent will be there under my direction.

Senator NEW. You say "except the De Haviland 4." That introduces a new subject. What is the present condition of the De Haviland 4 program?

Mr. NASH. Last week, for the first time, I came into possession of the complaints and suggestions of changes that are desirable to make the De Haviland 4 a fair machine. I immediately sent out a

wire to all the factories building that machine that not another machine was to go out of the door until the changes enumerated were made, and I enumerated the changes in a telegram.

Senator NEW. Then, all the De Haviland deliveries have been suspended for the present?

Mr. NASH. Suspended for a period of, perhaps, 10 days.

Senator NEW. Who, besides the Dayton-Wright people, are making the De Haviland 4, if anybody?

Mr. NASH. The Fisher Body Co. is the only one outside of the Dayton-Wright people that has delivered any. The Standard Aero have about 75 that are very well along, and could begin to deliver in a very few days.

Senator NEW. The Fisher Body Co. have how many?

Mr. NASH. About 6 per day was coming off their line when I stopped them.

Senator NEW. And the machine, as made by all of these concerns, had the same defects, did it?

Mr. NASH. Yes, sir.

Senator NEW. Were those defects enumerated in a cablegram from Gen. Pershing some time during the month of June?

Mr. NASH. Yes, sir; I think so.

Senator NEW. Could you tell us how many of those changes were listed in that cable?

Mr. NASH. I do not think I could. Many of those suggested changes had been made prior to the cable being received here. A number of important ones had not been made and were not made until now.

Senator NEW. Is it not a fact that between the date of the receipt of that cablegram from Gen. Pershing in which those complaints were made that deliveries of the machines were continued without corrections being made?

Mr. NASH. Yes, sir.

Senator NEW. Can you tell us how many of those machines were delivered in that shape?

Mr. NASH. No, sir; I have not a record of the number.

Senator NEW. It continued, however, for several weeks, did it not?

Mr. NASH. Yes, sir.

Senator NEW. It is true, is it not, that 155 of those machines were ordered by the Navy?

Mr. NASH. I do not know how many. I know there was an order placed.

Senator NEW. That was the number, 155. Do you know what disposition was made of that order?

Mr. NASH. There have been to my knowledge four of those delivered to the Navy at Miami, which they have reported on, and something in the neighborhood of 90 have been delivered to them at some seaport down here in the East.

Senator REED. What was the report on the four?

Mr. NASH. They recommended practically the same changes and made practically the same complaints that Gen. Pershing did in his cable.

Senator REED. They rejected the planes, did they not?

Mr. NASH. I think they did.

Senator New. Do you know what was done with the 90 which were delivered at the seaboard for shipment?

Mr. NASH. Those planes were held there until we could find out whether the best method would be to ship the parts on here and correct those here or whether it would be better to send the planes back to the factory which made them.

Senator New. Which was the Dayton-Wright?

Mr. NASH. Yes. The only reason I advised against shipping those back in the trainload shipment at this time was on account of the publicity that had been given to the planes as being absolutely no good, etc., and I thought that would serve to confirm that report and would stir up a worse muddle than we had, and we are losing nothing by letting them remain here until we decide whether to ship the wings and stabilizer devices, etc., down here.

Senator REDD. How long is it going to take to determine that?

Mr. NASH. Not very long. We will not lose any time because they are turning all their energies now to correcting the stuff we have coming through from plants. I thought we would get some good planes quicker by fixing the planes coming through production than by shipping planes back to the factory.

Senator FRELINGHUYSEN. Is not the engine too heavy and powerful for that type of plane?

Mr. NASH. I do not think so. You can get about as many reports as you can get pilots. I have talked with some of the oldest pilots that this Government has and they tell me that the corrections that we are now going to put in this machine will make a very good plane out of it.

Senator FRELINGHUYSEN. I would like to direct your attention to the testimony of three flyers who are back here from the front. One of these men has been on the front practically since the war began, and has been sufficiently important so that he was in command of 40 or 50 flyers. The other two men have been on the front, one of them about three years and the other a shorter time. They are all men who have distinguished themselves over there. These men told of some defects in this machine—I am speaking of the De Haviland 4—that I have not heard in the criticisms of other men. Some defects they spoke of they described as remedial. These men stated that they would not fly the machine and they would not send anybody up in it. I also call your attention to the testimony of Maj. Reinhart. I hope that you will take the time to read that testimony and I think we ought to furnish you with a copy of it.

Mr. NASH. I would not think this case was being helped very much if you did not. My contention is that the moment anything is known in reference to defects or the possibility of making any article better, that is the time that action should be taken and taken immediately.

Senator New. Mr. Nash, you say a few more than 1,000 De Haviland planes have been delivered to date?

Mr. NASH. Yes, sir; right around 1,000, as I understand it.

Senator New. Is it not true that every one of them possesses the defects that have been enumerated in the Pershing complaints, and in the complaint made by Capt. McCaughtry at the Miami field?

Mr. NASH. They contain some of the complaints. Some of them had been corrected, I found.

Senator NEW. Were they not all put out in the shape in which they were when those complaints were made?

Mr. NASH. Yes, sir; I think that is true.

Senator NEW. Corrections have since been made in some of them. Do you know how many?

Mr. NASH. All the corrections have not been made in any up until now when we stopped everything and put them in.

Senator NEW. Of course, you are a manufacturer and not an aircraft expert, I know, but is it not your belief, based upon what has come to you from pilots and such reports as that of Gen. Pershing to which I referred, the report of Capt. McCaughtry and others like them, that those machines delivered in the shape that they are are entirely unsafe and unsuited for operation?

Mr. NASH. My judgment and belief is that every one of those machines, before they attempt to fly them, should be corrected and brought up to date, as those are that we are going to put out now.

Senator FRELINGHUYSEN. I heard a great deal of the testimony from these flyers, and the principal criticism seemed to be that the engine was so high powered that it would strip the covering off the wings. Has any consideration been given to the fact that this engine is 200 pounds heavier than any other engine that has ever been put in there, with the exception of one Rolls-Royce 375 horsepower?

Mr. NASH. Yes; there is now. Consideration has been given to that and corrections are being made in these wings by putting in extra ribs and the new method of attaching the fabric to take care of that very condition that you mention.

Senator FRELINGHUYSEN. Would not the increased weight of 200 pounds be making the airplane nose heavy; can that be overcome by any structural improvements—structural strengthening? Is it not true that the engine is too heavy and that a lighter engine should go in that plane?

Mr. NASH. I would not say that that is so. I would say this: That if we were starting out anew, without doubt it would be desirable to do that very thing.

Senator REED. What very thing?

Mr. NASH. Putting a lighter motor in the place of the heavier one—but we can get some planes that will be safe and will be, perhaps, 80 per cent as efficient as we would like to have them, and the question arises whether we should have something that is 80 per cent as good within the next six months, or have nothing.

Senator FRELINGHUYSEN. I noticed in the list of engines that were in the De Haviland 4's manufactured by engine concerns that the majority of the engines were 200 horsepower; that there was one engine of 300 horsepower, and one of 375 horsepower, but that they were all lighter engines. Would not the 300-horsepower Hispano-Suiza which we are manufacturing be a more dependable engine in the De Haviland 4 than the Liberty?

Mr. NASH. The trouble is that we are not manufacturing the Hispano-Suiza.

The CHAIRMAN. We expect to pretty soon?

Mr. NASH. No, sir. That is where the trouble is. The public and the people who are in charge all believe that the engine is in production, and, as a matter of fact, it is at least five months away.

The CHAIRMAN. We do not believe it is in production, but Mr. Houston, of the Wright-Martin Co., appeared before Senator Frelinghuysen and myself, representing the committee in the latter part of June, and detailed the preparation that his company was making for the production of that motor, and also a test of a sample motor which his company had produced and which he saw at New Brunswick. My recollection of his statement was that his company would be in production of that machine early this fall. That is my reason for saying——

Mr. NASH. I am basing my judgment upon what I have seen and know of the production of gasoline motors, and I am going to state that you need not look for the production of any of those motors before the 1st day of January.

Senator FRELINGHUYSEN. Then you have no 300-horsepower motor, or about that horsepower, in sight?

Mr. NASH. We have not.

Senator FRELINGHUYSEN. We have only the Liberty motor, which is a much higher horsepower.

Mr. NASH. That is the only one.

Senator FRELINGHUYSEN. Would many of these defects and structural weaknesses we overcome if we had a lighter motor?

Mr. NASH. I do not think so.

Senator FRELINGHUYSEN. Why have the English limited their horsepower and weight in that machine?

Mr. NASH. Because they happened to have those motors. I do not wish to be understood that if I was starting out I would have gone and designed the Liberty motor to put in the De Haviland, but that was the one motor we did have and it was a question whether it would work in there, but they put it in and I think now, while I am new at this, that there is a good deal of prejudice against the De Haviland 4 that will be removed when we have these so-called defects remedied and get the machine up to where it has been recommended.

Senator NEW. Mr. Nash, in that connection I am going to ask you if, based upon the complaints that have been made by Gen. Pershing, by Capt. McCaughtry, by pilots and flyers, some of whom have testified before this committee, and to which your attention has been called, if you believe that with those mistakes corrected the De Haviland 4 would be a first-class machine?

Mr. NASH. I would not say that I would believe it would be a first-class machine. I believe it would be an average machine.

Senator NEW. An average machine for what purpose?

Mr. NASH. For the purpose that the De Haviland 4 was designed for, which is, I believe, called a day-bomber machine.

Senator REED. But not for a fighter?

Mr. NASH. No, sir.

Senator REED. What are we going to do for a fighting plane?

Mr. NASH. We have to start to make them.

Senator REED. I notice that you concur in what Capt. Kelley said. He was one of these flyers.

Senator NEW. Mr. Nash, what is the essential difference between the English and American De Haviland 4 plane?

Mr. NASH. I am not posted on that, Senator.

Senator NEW. Do you know how many changes were made in the plane of that type as compared with the English model in our manufacture over here?

Mr. NASH. No, sir; I do not know.

Senator NEW. Report comes to me that the Handley-Page machine, which we recently turned out at the Standard works, can only be taken to a height of about 3,500 feet with the two Liberty motors. Do you know whether that is true or not?

Mr. NASH. No, sir; because they have built only one machine and it has not been turned over to the engineering department of the Aircraft Production or to the technical section of the Military Aeronautics. They are building the second machine, which is to be immediately shipped to Wilbur Wright Field when it is completed to make those very tests to see whether it will be——

Senator NEW. There never has been an official Government test made of that machine?

Mr. NASH. No, sir.

Senator NEW. I asked you that question for the reason that the point was made by my informant that the Liberty motor in its present condition would not suffice to take a heavy machine to an altitude that would be necessary in order to render that machine effective; that realizing that this is the case the English are transforming the Liberty motor into a geared motor in order to make it effective in the heavy machines to which they are adapting it over there. Do you know anything about that?

Mr. NASH. Yes, sir; that is also being worked on in this country, to adapt the gearing to the Liberty motor so that we can use it in the same way that we do the Rolls-Royce.

Senator NEW. It is true, then, as it stands to-day, that the Liberty motor is not adapted for use in the heavy planes?

Mr. NASH. I would not say that that is so, because they have not tested it to find out.

Senator REED. Do you not think it is pretty nearly time that men connected with aircraft production should cease making speeches and giving out interviews to the newspapers and telling them that the whole problem is solved?

Mr. NASH. Senator Reed, I have talked by the hour about that thing. To my mind that is where the great mistake has been made. They have gone and given out this great publicity, and they have led the public to believe that the so-called Liberty motor was a cure-all for everything; that we are going to march right into Berlin with it; and in order to keep the public in any sort of frame of mind they have done more to get production than to get something which was right.

Senator REED. I refer to the alleged speech of Mr. Ryan when they tried the Handley-Page; that at last America was in production, and that it was a great success; and if the plane, according to your own views, had only been partially tried, and according to my views and the views of everybody who has studied this question, no plane should be pronounced a success until it has been tried in every conceivable situation.

Mr. NASH. I agree with you, and provision is being made now to do that thing, or I will not be connected with aircraft production.

Senator NEW. I have here a statement sent out by the Associated Press from Portland, Oreg., under date of August 1. The headlines over this state what Mr. Ryan does not fully say in his speech, but they are so entirely misleading as to call for some comment. Here they are: "Director Ryan indicates United States will soon have 50,000 planes ready." Then follows the dispatch: "Portland, Oreg., August 1. John D. Ryan, director of aircraft production, told a crowd of several thousand soldiers working in spruce camps at Vancouver, Wash., that the United States aircraft program is rapidly coming to fruition; so rapidly, in fact, that thousands of airplanes for service overseas now are in sight. The number of planes soon available was indicated when Mr. Ryan said: 'Fifty thousand motors have been ordered for them, and that the new motor was worthy of the highest praise.'" Now, that dispatch, with headlines similar to these, appeared in every newspaper in the western country on the morning of August 2 and on the afternoon of the same day. Mr. Nash, is any such performance as that even remotely possible?

Mr. NASH. It certainly is not and I believe that Mr. Ryan has been misquoted.

Senator NEW. I am not saying that he was not, but I am saying that this interview, a copy of which I hold in my hand purporting to have been given by him, was widely and generally circulated all over the United States on August 2, and has never been denied by Mr. Ryan or anybody else and never will be denied perhaps until it is denied on the floor of the United States Senate and then the Senator who denies it will be accused by all the publicity agents of the United States Government with being pro-German and a friend of the Kaiser.

Mr. NASH. If I am ever given permission to address a large gathering I expect that I will be kicked out of the service of the United States Government, because I do not believe that it gets you anywhere to tell anything except the truth. I believe that the public are entitled to know what we are doing, and we are a part of the public, and I do not see that anything will be gained by doing otherwise.

The CHAIRMAN. I am satisfied that Mr. Ryan was misquoted in what he said at Elizabeth.

Senator NEW. Mr. Nash, is it not true that 50,000 aeroplanes is practically twice as many as have been even asked for by the American Army on the other side.

Mr. NASH. I have not the figures in my mind, Senator, of just the number that Gen. Pershing has requested, but I am inclined to think that it is considerably under the figures you have stated.

Senator NEW. Mr. Potter stated when he was testifying before this subcommittee the day before yesterday, that the program called for 26,000 planes of different types, and Mr. Potter also said that he had very promptly sent forward a reply to the effect that it was hopelessly impossible for the Aircraft Board here to begin to comply with it; that while he made no promises, that he hoped that by the 1st of July, next year, they might be able to furnish a total of 18,000 planes; that he gave no guarantee of being able to do that and that that was nothing but a hope. Now, what have you to say along that same line, Mr. Nash?

Mr. NASH. From my small investigation of the situation my judgment is that we will deliver no planes excepting the De Haviland

4 prior to January 1, 1919, and that if we should be able to deliver 10,000 by July 1, 1919, we would have accomplished almost a miracle in this country.

Senator NEW. Ten thousand planes of all types combined?

Mr. NASH. To go across the water. I do not wish to include in that training planes that are used here.

Senator NEW. We are speaking, of course, of planes that are intended for practical use by the military on the other side, not training planes.

Mr. NASH. That is what I referred to.

Senator FRELINGHUYSEN. I have been away from the hearings and am not well informed as to what the evidence has been, but you are in Mr. Ryan's organization now, are you not?

Mr. NASH. Yes, sir.

Senator FRELINGHUYSEN. Are you the efficiency expert?

Mr. NASH. My position is assistant to the director of aircraft production in charge of engineering and production.

Senator FRELINGHUYSEN. What is Mr. Landon's position?

Mr. NASH. He is in charge of production and comes under me.

Senator FRELINGHUYSEN. Mr. Ryan has had no previous experience in aircraft production?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. Has Mr. Landon?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. Have you?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. What has been your experience?

Mr. NASH. I was 20 years in the vehicle business, connected with the largest concern in the United States, and I have been eight years in the automobile business, six years of which I was at the head of the General Motors Co. and two years with the Nash Motors Co.

Senator FRELINGHUYSEN. You have had experience with men connected with the Aircraft Production, and I should like to know whether you have associated in your organization any men who have had any experience in aircraft production, either here or abroad in this new organization.

Mr. NASH. As far as I know there are no men in this country who have had experience in aircraft production, except those connected with the Curtiss people, other than to make a few sample planes.

Senator FRELINGHUYSEN. In other words, it is practically a new profession to the men connected with it.

Mr. NASH. Yes, sir.

Senator FRELINGHUYSEN. The policy of the old Aircraft Production Board has been, as I have observed the evidence, to ignore the advice of the men who have had experience in England and France and Italy. What is to be your policy in regard to the various experienced aircraft engineers, flyers, and builders who are over here?

Mr. NASH. My understanding, Senator, is that there is now connected with this aircraft production organization a Commander Briggs, whom England has furnished to our country and who they claim to be their most expert man on aircraft over there.

Senator REED. Is Commander Briggs now associated with you?

Mr. NASH. He is now at the present moment in England, but will be back in six weeks.

The CHAIRMAN. He has been released by the British Government from service for the purpose of assisting in this country?

Mr. NASH. That is my understanding.

The CHAIRMAN. Will you tell us what authority he will have when he comes here?

Mr. NASH. His position will be an advisory position.

Senator FRELINGHUYSEN. The evidence that the committee has taken shows that the advice of the experienced men who have come here in the various commissions from France, Italy, and England have been ignored, and you now state that Commander Briggs will be associated with the engineering corps in your department.

Mr. NASH. In an advisory position.

Senator FRELINGHUYSEN. In an advisory capacity. Then he will be under the direction of Col. Vincent, will he not?

Mr. NASH. I would not put it just that way, because I would not permit any man in the organization to direct a thing if his directions and my judgment did not agree. I reserve the right in this whole program of engineering and production to cast a deciding vote before we make any moves. If I am to take the responsibility and be responsible to the United States for doing something, I propose to be clothed with the authority that will let me do something.

Senator FRELINGHUYSEN. Well, we have had a lot of men who have faced this problem and have solved it. They have produced combat planes, they have produced fast-flying fighters, and the organization has gone along trying to produce airplanes, relying upon their own experience and knowledge, and, in my opinion, it has been an absolute failure. Now, the question is whether we are going to take the advice of men who have made a success of it or whether we are going to get along trying to make experiments ourselves, without using that expert knowledge. There are men here from Italy and from France and from England who have advised the Aircraft Production Board. The testimony shows that their advice has been ignored. The question is whether this new organization, in their effort to produce airplanes, is going to listen to those men, because as far as I can learn there is no one in America that knows anything about airplane production.

Mr. NASH. The organization that I hope to build in Dayton will be composed of the best engineering talent we can secure in America. Those that we are unable to secure the services of continually we hope to have them serve as consulting engineers in conjunction with the best talent that we can secure from England, France, and Italy, and when any new type of plane is discussed I propose we will set in in conference and discuss that plane and get the views of the best talent that there is here. I reserve the right after we have listened to all the evidence in the case to render a decision as to what we shall do. It would make no difference if Col. Vincent or Col. Bane or anyone in America differed from the gentlemen abroad or differed from my opinion. I have made it plain to Col. Vincent he would have to smile and put in his best efforts to accomplish whatever I have in view.

Senator REED. Can you give us the names of those men that you now have in mind that you intend to have associated with you?

Mr. NASH. I can not give you the names of the men that I intend have associated with me continually, because I have not had an opportunity to see them. I do not know whether we can go out and hire these men or not. I would like very much to have Mr. Day, of the Standard Aircraft Co., but we are unable to get his services permanently. He has consented to come in at any time into any conference and give us the best advice he can. I know Mr. Crane, of the Wright-Martin Co., will do the same thing. I have not yet been in touch with the engineers of the Curtiss people, but I believe—

Senator FRELINGHUYSEN. How about Mr. Kettering?

Mr. NASH. I believe that he is one of the brightest men in the engineering profession in the United States. I think he knows more about airplanes than many men who have been in it for years and he has agreed to sit in any conference, night or day.

Senator FRELINGHUYSEN. Who have you from the Italian Commission over here?

Mr. NASH. That I do not know because I have been in it only a few weeks. My judgment is this: That if we have to start out now and design new motors and new planes, the war will be over before we have any; we will be licked or the other fellow will be licked. I think that we have to take some of the best things that are in production on the other side and duplicate them and get them over here. You will know just where I stand on this. There have been in this country for several weeks and maybe for several months, two Bristol planes shipped over here with Rolls-Royce motors. They have just reached the McCook field and it is not possible to go to work and get a jig up and tool up and build Rolls-Royce motors within a year. You might just as well say that you are going to be a year when you start. They have, however, this 300 Hispano-Suiza that I think will be in good production about January. They have the Liberty engine that should get into production about the same time. Now, instead of that we might use these motors and make time we have put into the design of the Bristol planes the 300 Hispano-Suiza, which is on the McCook Wright field and is going through a series of tests, and Mr. Day was over there yesterday and brought me back the figures, and I want to say that they are very fine.

The climbing and everything with that Hispano-Suiza 300 seemed to be fine. They did not do as they have been doing; take an empty machine and go out and do some things, but they loaded that machine with all the bombing devices, if it has bombing devices, and the extra clothing that the pilots wear and went so far as to put in weight to make up for the lack of weight in the observer, and the first climb was really remarkable. He is not connected with the department and I got it from him and it would be an unbiased opinion. They did not change a thing in that plane. The only thing they did was to move the front end so the Hispano-Suiza would set in. In the other one we have set in an eight-cylinder Liberty and they did not even change the English radiator and it was all ready to go out the door last night. My idea is if those machines prove up, I will say to the Congress, "Now, just don't mind whether you think you know better than the English do. We will just duplicate those machines to the very nut, bolt, and screw, and in January we will be building some

planes for our boys on the front." They say to me this, Senator Reed: "We could make this better if you let us use laminated wood." I say, "We have no time to experiment. The house is afire and we have to put it out." That is my position if I stay with this proposition, and I will only stay just so long as they will let me run it as a business proposition.

Senator REED. You have expressed so many views here that I can say are the views of this committee that I am going to venture to make a suggestion and then I want to ask a question or two. Some commission, board, or officer, or somebody else representing the United States Government, went over to France—I think it is about a year ago, or something like that—and they saw the Caproni machines and fell in love with them, and sent for Mr. Caproni and brought him over to the front and practically made an arrangement with him by which this Government was to enter into the production of those machines, and thereupon Mr. Caproni took the head man of his factory, Capt. D'Annunzio, and two of the best flyers they had, and some other experts, and sent them over here; and those men tell us that they came over here expecting that this Caproni machine and one other which they brought with them, which was a fighter, would be tested out by our Government and that they would be at once put into production and these men would be put in charge of plants and given a free hand to get the work out. We learn, not only from them but from flyers at other fields and places, that when these flyers came there they were treated with a sort of cold politeness; their machines were given a perfunctory test, then sent to Long Island, where they have been doing apparently nothing except that, after a long delay, they were asked to develop the plans of one or two Capronis. Now, those men are here and you are now talking about organizing a commission or board of experts. In other words, I take it you have spent enough to realize the fact that there has to be a plan for a machine before the machine is built.

Mr. NASH. I think I do.

Senator REED. And if that plan is perfect the machine may work, and if it is imperfect the machine can not work. Now, I hope that you will see those men. They have been eating their hearts out down there, and the two flyers have both been killed here.

Mr. NASH. I have gone into that Caproni situation at some length and I have found this: That D'Annunzio was given authority to go to work and build three machines at the Standard plant; but, like lots of other engineers, instead of building a machine just like the Italian machines, he thought that he could make it better, and in the three machines that he started out to build there are no two of them alike. They have built one and that is over at Mineola, and the reason it is not flying is because there is no one to fly it. They have sent for some Italian flyers. I also was in Detroit the week before last for the purpose of seeing Mr. D'Annunzio, and found that he was out at Mineola and was there with some of his men taking the motor out of the machine and doing something with the machine which had already been built. I had proposed to be in Detroit to-morrow morning, and that was the object of my trip. This Government attempted to let a contract for 500 Capronis to the Curtiss Co. and 500 to the Fisher Body Co. without having built any machines and proved

them up. I maintain that whenever you bring a machine over here, no matter how successful it has been on the other side, and equip it with an American motor you are going to have different results. It would be suicide to do it. I told Maj. Vincent not to do a bit of work, and we gave the Fisher Body Co. an order from the engineering department at Dayton to build, under the direction of D'Annunzio, three machines and to do it in the quickest possible time that they could, and upon the tests of those machines—one by sand test and one on the Wilbur Wright Field—would depend whether we would proceed with the construction of Caproni machines.

Senator REED. In other words, the Caproni machine, having to be equipped with Liberty engines, you can not just copy the Italian Caproni.

Mr. NASH. Certainly not. Because you are putting in a heavier motor and with a different action and power and you can not do that any more than you can take a Ford automobile and put in a Cadillac eight-cylinder motor.

Senator REED. That is exactly what we have been trying to do with all these aeroplanes here, is it not?

Mr. NASH. Of course it is. I feel that it is unbecoming to me—I have been forced into this work very much against my will and I think it is unbecoming in me to criticize the people who have preceded me, but I told them if I was ever called before the committee I would call a spade a spade.

Senator REED. You owe these boys who are going up in these machines the best machines you can produce.

Mr. NASH. You bet we do, and I owe the best service I can render to this Government. That is why I am here.

Senator REED. I want to ask you about placing Col. Vincent in this important position under these conditions. Have Mr. Vincent and Mr. Hall, the two men who have created what was finally called the Liberty motor——

Mr. NASH. No; I would not say so. I do not think that Hall had anything to do with it.

Senator REED. I am saying that on the strength of the testimony that has been given to us, that Vincent and Hall were locked in a room and were told to agree upon plans, that they agreed upon this motor, and that they then went together and drew the plans and sent the plans of the parts to different factories and had them back and assembled on the road to Washington in a car and set the machine up and it ran. That is the story as it has been told to us. I will say now, so there will be no misunderstanding about the facts, that we have learned the Packard people had been experimenting with a motor and they had produced what appeared to be a pretty likely sort of airplane motor, not yet perfected, and that that was based itself upon the Mercedes, and that the Liberty motor is really a development now of this Packard motor. Now, Col. Vincent was very active in that, was he not?

Mr. NASH. Yes; I think he was the engineer on the job at the Packard plant.

Senator REED. That emphasizes more what I am going to call your attention to. He was the engineer. This engine is the child of

his brain, and Col. Hall was certainly intimately associated with the initial production of this machine. Now, we have run across this, that Col. Hall was out here in a plant inspecting engines and planes that are to contain the Liberty engine, and then those planes when they were produced with this engine in them were sent out to Dayton, Ohio, to be subjected to their final tests by Col. Vincent. In other words, one of the men who helped conceive the engine passed upon its production and the other man whom you think really did conceive the engine passed upon its performance in the plane.

Mr. NASH. They may have in the past but they will not in the future. They are relieved of that responsibility. The military aeronautics are the people that are going to use this production, and they are the people who will pass upon anything and everything that is produced.

Senator REED. Will you put into this corps some practical actual flyers?

Mr. NASH. The man who is to head that corps is reputed the best flyer that the United States has, and that is Col. B. Q. Jones.

Senator REED. And, generally speaking, production has been stopped until you have tested things out and have some reasonable ground to believe they are going to work?

Mr. NASH. Absolutely. It is suicidal to handle it in any other way.

Senator REED. As we went around to the factories and I saw them putting together the parts of these machines, little pieces of wood here and there and the other place, I confess to you it looked to me at the time that it was very loose work, but I did not know anything about it and I assumed that Government inspectors and factory inspectors together with the enormous responsibility that any man would take in turning out a machine was certainly a guarantee that this work was all right, but it now transpires that it is admitted that a great deal of this work has been inferior. We have been told that carpenters are used as instructors and that there are in this country cabinetmakers, men who know all about close and correct fittings of wood—I want to know what is going to be done towards getting that kind of talent, the kind of men who can put together the wooden fittings accurately, the piano and the musical-instrument makers, putting them into your organization.

Mr. NASH. The policy is going to be to no longer try to plug round holes with square plugs, but to put round plugs into round holes.

Senator REED. In other words, you intend to get some men who know something about close woodwork to do this sort of instruction?

Mr. NASH. Yes. If I want to find out something that I do not know I usually go to the man who is reputed to have that knowledge in order to get it, and I quite agree with you that there have been a lot of mistakes made. It has been a mushroom growth, and in many cases they had no conception of what had been accomplished or what they were trying to accomplish.

Senator REED. One of these officers who is back from the front who has been with the English and French, his testimony is to the effect that the making of an airplane is largely a question of hand-work—that is, of making everything perfect.

Mr. NASH. Yes, sir.

Senator REED. Can not something be done so we can use this great factory force and get work done that will be firm and solid?

Mr. NASH. There is no question about it. There is nothing mysterious about this work, Senator. To me there is nothing mysterious about the airplane program. It is just to secure men possessed of the knowledge to do certain things and put them on it and let them do it.

Senator REED. We have had complaints made to us by men who have been engaged in the airplane business in perhaps a small way that they have not been called in or consulted or given any work. What is the objection to giving a large number of small factories contracts for the production of such a number of machines as they can get out?

Mr. NASH. Why, there are, in my judgment, very few of the small factories that are capable of building anything but the first sample, three or four planes. They could not get out any considerable production on account of lack of facilities.

Senator REED. Suppose they worked slowly and yet produced five or six planes in five or six months; that would help.

Mr. NASH. My purpose is to make use of the present facilities in this country and not build up new facilities.

Senator REED. The thing I am trying to bring to your mind is this: Instead of limiting the construction of these aeroplanes to four or five factories, if you have a type of plane that is approved it would be a desirable thing if there is a small factory over here with a few men to let them build such of them as they can.

Mr. NASH. It would depend entirely on whether they would be able to produce any number which would be worth while, because the expense of jigging up and tooling up in a factory—the expense to this Government—would be just as great as it would be to jig and tool up for a plant to build 4,000 planes, and you would have to have the same kind of inspectors. I think the smaller plants should be used to produce sample planes, and after they have the specifications they would be kept busy.

The CHAIRMAN. By way of illustration we had before us the representatives of the Wittemann-Lewis Airplane Co., of Newark, who have been in the business since 1903 or 1904, building, of course, planes for such a demand as existed before the war, but excellent workmen with a small factory thoroughly equipped with first-class men. In 1916, in the month of October, they got an order to make a sample plane and made it and flew it under its own power over to Mineola where they were not afterwards allowed to make a test of it and have not been able to go and test it since. Then Mr. Lang came before us, an expert maker of propellers engaged in the business for a year before the war broke out, who came over here and expected to engage in the program. He was said to be an expert manufacturer of propellers, and he complains that his little force, that he could increase with first-class men, was given no opportunity to make propellers. I am sure I express the opinion of the committee that such men to the extent of their capacity ought to be employed on a program involving an article too much of which we can not get.

Senator REED. In that connection I will call your attention to the man named Lawson, from Green Bay, Wis., I think. He says that he has been building airplanes, that his planes have flown, and that he

has a plane that he is anxious to have tried out and that he has been refused a permit to fly the machine down here to show it. He was afraid to tell me about it, saying that he was afraid he would get in bad. He told me that he had studied this question in England, and has for 10 or 14 years been in the aircraft business. If such men come around I am sure you will not be too busy to listen to them.

Mr. NASH. I certainly will not. I know Mr. Lawson, and I wrote him the day before yesterday that next week we will be at the office and we would go over his drawings. We have a committee now who will go over these things. When he comes over there with his drawings there are well-established rules now with reference to airplanes that they must have a certain ceiling and certain factors of safety and must be able to carry a certain number of pounds for the wing area. He has to do now with the committee which will be composed of the technical section of the military aeronautics. It will be Cols. Bane and Jones, who is an engineer, and a good flyer, and such other engineers as we have there, and they will take those drawings and go over them and criticize them, and if they prove all right the chances are that that man will get an order to build four of these planes, one for a sand test, one for the engineering department, and two to be turned over to the military aeronautics to be proved up.

Senator REED. Will you not at least let this fellow fly this machine down here?

Mr. NASH. I have not the slightest objection to that.

Senator NEW. Both Col. Bane and Mr. Potter testified as to the expenditures made in the experiments on planes.

Mr. NASH. You say this man is building a plane. If he has not taken a stress analysis and has not made a test of his plane—anybody can build a plane that will fly, but when you have to do the things that they have to do in warfare it requires greater factors of safety and greater range, and we have that information, and what we want to do before spending any of the Government's good money is to start the fellow off right.

Senator FRELINGHUYSEN. The criticism of the policy of the Aircraft Production Board and the treatment of the Wittemann-Lewis Co. was this, that the Wittemann-Lewis Co. had a factory and had been manufacturing aircraft prior to the war and without the utilizing of that factory they went out and encouraged people to take old factories and start in the airplane business without any experience whatever. These boys have built a number of aeroplanes and flown them for exhibition purposes. They have factories well equipped. They have been surveyed by the engineers of the department, and then when they asked for a contract they were penalized by being asked to pay \$500 for the plans and \$200 for every machine that they turned out. Now, that was manifestly unfair, and especially when they were practically putting up for other fellows to start in who had had no experience. Now, Voght is a little manufacturer; and if he is entitled to consideration, these boys are entitled to the same consideration, particularly after you have made an inspection of their plant. I have no interest in it except that it was a policy that I condemned of the Aircraft Production Board.

Mr. NASH. Of course, I am in an unfortunate position, being so new in this business, and I am not responsible for the errors of my

predecessors, but there have been a lot of mistakes made, and I think it is largely due to the newness of the industry.

The CHAIRMAN. Have you heard of the cross-license agreement?

Mr. NASH. I have heard of such an agreement similar to the one we have in the automobile industry.

The CHAIRMAN. It is an agreement which was executed subsequent to our entering into the war and having for its purpose the handling of the patent situation. Those who have signed the so-called cross-license agreement after obtaining contracts from the Government without exception say that they did so because, and only because, the representatives of the Aircraft Production Board required them to do so or requested them, and when they requested it these contractors construed the request into a license requirement. They say that in addition to the royalties which they have to pay on their machines is the added fact that they have to pay for copies of plans and specifications, furnished generally by the Curtiss people, and who will only deliver them upon receiving 1 per cent of the contract price. I would like to ask you what the policy of the new organization is going to be in regard to that.

Mr. NASH. That is too entirely new to me, and I have never heard of it, except that there was an agreement in vogue.

The CHAIRMAN. I should add, perhaps, that since Mr. Potter came in the requirement does not seem to have been made.

Mr. NASH. My position is this: We are at war, and I think aircraft licensing, or anything else that you may call it, should be waived and we should go out and build the best planes at the best places and get them to France at the quickest possible moment.

Senator REED. There is no monopoly that the United States has ever granted to an individual that ought to stand in the way of the United States itself in a time of war.

Mr. NASH. I do not believe there is.

The CHAIRMAN. What is your opinion of the expediency of the Government's taking over of some of these plants and operating them itself?

Mr. NASH. I think it would be suicidal.

The CHAIRMAN. Take, for instance, such plants as the Standard and the Curtiss, whose organization is reported to us to be very bad, and which do not seem to be able to get anywhere, and who are engaged in a sort of chronic difference with the expert accountants of the department. What are you going to do with them?

Mr. NASH. I am going to get them together with the people who executed those contracts and get those contracts interpreted. There is a misunderstanding in every plant, as far as I have been able to discover, as to the interpretation of those contracts, and they were not made plain when they were made, and the only way I know of to straighten them out is to get the contractors and the people who made the contracts together and get them straightened out in that way.

The CHAIRMAN. That does not meet the other situation, which is a lack of efficiency and organization on the part of the contractor.

Mr. NASH. My judgment is that if efficiency and organization does not exist you do not want to go and look for it in the United States Government.

The CHAIRMAN. I should perhaps say in this connection that I had an informal talk with Mr. Ryan about it, and he believes that as to some of these concerns it is absolutely necessary to take them over.

Mr. NASH. He is basing his opinion upon the report of somebody who had a chewing match with somebody in the plant. I think you will find it is about fifty-fifty—that the Government's part of it is about as bad as the contractor's part.

Mr. FRELINGHUYSEN. I understand that the Japanese Government controls the Standard Aircraft Co. at Elizabeth, or at least the Japanese bankers who have represented the Japanese Government in the past have loaned money to its president—Mitsui Bros. In that connection, would it not be advisable for you to look into that ownership, particularly when you are manufacturing airplanes of foreign design and patent? Do you know that?

Mr. NASH. I heard of it yesterday.

Senator NEW. I can add to that that the Handley-Page people tell me that their planes were placed for manufacture here in the hands of the Standard Co. and that it was no time at all after they had received the plans that they found that that plane, according to those plans, was being manufactured in Japan.

Senator FRELINGHUYSEN. In that event, would it not be advisable for the Government to assume some control over the plant?

Mr. NASH. I do not know. It is not very much use of putting up the bars after the horses are out of the stable. If what you say is true, the damage is done.

Senator FRELINGHUYSEN. Not entirely. If its ownership could be transferred so that it would be in the hands of American owners, it would be much better.

Senator REED. What is the matter with them?

Mr. NASH. I think they have gone ahead on some people's say so, that they were going to get to these orders, and have bought materials, and they are now trying to sell the materials to pay their bills. I understand they have got more money from the Mitsui Co., and I do not believe they are a very sound company.

Senator REED. Ought they to be allowed to have it in the sense of that company being dissipated and that company going out of commission?

Mr. NASH. I think not. I think that the Standard Aircraft should immediately be gotten together with the people who made the contracts with them and with the Aircraft Production Board and agree as to what their standing is and what is to be done in the future and then go ahead and do it. First of all, I think it should be investigated, but not in the way that they have been investigated. I walked through the plant, but I can not say they are rotten, but others have said they were rotten.

The CHAIRMAN. You made a statement just now to the effect that the Standard Co. was headed for the rocks. I was going to ask your opinion of the Curtiss plant.

Mr. NASH. I have not been near the Curtiss plant. If the Standard Aircraft Co. proceeds as they are now proceeding, they will be in financial difficulties.

Senator FRELINGHUYSEN. If you need their production, and that plant is valuable to you, it would seem the part of wisdom for you

to make an investigation of their ownership and their financial condition.

Mr. NASH. What would be the attitude, providing we found that the company was owned and controlled by the Mitsui Co.?

Senator FRELINGHUYSEN. That is a question of policy that you yourself must determine.

Mr. NASH. No; I can not. That question came up to the Assistant Secretary of War the other day, and that, I think, is beyond the power of any of us.

Senator FRELINGHUYSEN. That should be submitted to the department, and you should be relieved from any breakdown in its ownership. I take it that you are willing to accept suggestions and criticisms in regard to these plants. Now, I have been in the fire-insurance business for 30 years, and I made a bird's-eye view inspection of the Curtiss plant, the Wright-Martin plant, and one of the plants of the Fisher Body Co., and the Standard Aircraft Co. at Elizabeth, and I want to say to you that if you are relying upon each one of those plants to produce airplanes and you would be embarrassed and your production checked by fire, that you ought to take up with those plants the question of extending their fire protection, particularly their sprinkler apparatus. Confirming my judgment, the fire-insurance men have formed a bureau in Washington to aid the Government in inspecting the fire hazards at the various plants that are making munitions of war and they have a report on each one of these plants. The committee is headed by Mr. Henry Evans, of the Continental group of insurance companies, a very able man, and he calls my attention to the fact that he has spoken to Mr. Ryan, and so have I. I would suggest to you that you include in your contract a clause that will compel these men to follow out the recommendations of this fire-prevention bureau in the plants in order that you may be assured that the capacity of that plant will be continued for Government uses. I have the letter and the suggestions, and if you are handling it I would be glad to give them to you.

Mr. NASH. I think they should go to Mr. Ryan, and they have agreed that no contracts shall be executed until I say whether they are ready to produce or not.

Senator FRELINGHUYSEN. I have no hesitancy in saying that the Standard Aircraft plant or the Curtiss plant is liable to burn down any minute; that unless they increase their hydrants and establish more rigid rules in regard to drying their wood and the use of their dope, they are liable to have accidents there at any time.

What was the concern that bought the Delco Ignition System?

Mr. NASH. The United Motors.

The CHAIRMAN. We thank you very much, Mr. Nash, for appearing and testifying before this committee.

MOTION OF SENATOR REED.

Senator REED. I move that 500 copies of the complete testimony taken by the subcommittee and 500 copies of the condensation of said testimony be ordered printed by the Government.

The CHAIRMAN. As I hear no objection, it is so ordered.

(Whereupon, at 5.30 o'clock p. m., the subcommittee adjourned to meet at the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 9, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 12.30 p. m. in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Frelinghuysen, and New.

The CHAIRMAN. We have with us the Secretary of War, whom the committee will be glad to hear this morning.

STATEMENT OF MR. NEWTON D. BAKER, SECRETARY OF WAR.

Senator NEW. Mr. Secretary, I have just a few questions that I would like to ask you with reference to aircraft matters. Are you acquainted with the conditions of the country's aircraft program?

Secretary BAKER. In a general way.

Senator NEW. What is the general situation with regard to it?

Secretary BAKER. In what particular?

Senator NEW. Is it satisfactory or otherwise?

Secretary BAKER. I do not like to indulge in generalities about it. The aircraft program is being worked upon by the largest number of most expert persons we can find, and progress is being made. It is not such progress as the country desires to see made, but it is the best that we have been able to do.

Senator NEW. Has this country produced any combat planes that are now in use with our forces abroad?

Secretary BAKER. I can not answer that. I do not know.

Senator NEW. Is it not a matter of official record in the War Department that there are no American-made airplanes now in use by our Army in France?

Secretary BAKER. It was some time ago. I do not know what the present status is.

Senator NEW. You are Secretary of War.

Secretary BAKER. Yes.

Senator NEW. And that is certainly a very important bureau of the War Department, is it not?

Secretary BAKER. Obviously.

Senator NEW. Has there been brought to your attention the cablegram sent by Gen. Pershing, or in his name, under date of June 26, enumerating a large number of defects in the De Haviland 4 planes, and stating that the machines of that type already sent him can not be used in their present condition?

Secretary BAKER. Yes.

Senator NEW. Are you aware that a considerable number of those machines have been sent to Gen. Pershing since the cablegram was received in which the defects of which he complains had not been remedied?

Secretary BAKER. No; I am not aware of that. I have no doubt that some have been sent in which some of the defects in which he pointed out were not remedied, but whether they are identical with the machines he was then describing, I do not know.

Senator NEW. It has been testified to here by various witnesses, among them Mr. Potter, Mr. Nash, and, I think, Maj. Muhlenberg—at all events, by several officers of the department—that that is the case. In that case, Mr. Secretary, what is the War Department going to do about it?

Secretary BAKER. About what?

Senator NEW. About those machines having been sent in that condition?

Secretary BAKER. Those machines will undoubtedly be placed in repair and in proper condition abroad.

Senator NEW. Do you think that after complaints of that kind were lodged against it by Gen. Pershing that they should have been sent before these defects were remedied?

Secretary BAKER. Many of the defects pointed out by Gen. Pershing's associates in the aircraft division over there were minor and were in process of correction by them. The question as to whether it was wise to continue sending machines or to wait until all of those defects could be corrected was a question of judgment and was solved in favor of sending them and not interrupting the flow of machines while the change was being made, and I think that was wise.

Senator NEW. The Bristol plane has been ordered out of production?

Secretary BAKER. Yes.

Senator NEW. The Bristol and the De Haviland 4's are the only types of planes on which we had reached production basis, are they not, other than training planes?

Secretary BAKER. Yes.

Senator NEW. Have you any knowledge as to how long it will take to make over the De H. 4 in accordance with the complaints made by Gen. Pershing and Capt. McCawtry?

Secretary BAKER. I have not.

Senator NEW. In that connection I might state that Capt. McCawtry is an officer of the Navy in charge of the naval testing field at Miami, Fla., and that at a recent date he made a report concerning the De Haviland 4 planes to the effect that they could not be used until after a number of alterations had been made in them. Mr. Potter and Mr. Nash have testified before this committee that it will be several months—January 1, 1919, and perhaps later—before we are able to supply our forces with any serviceable combat planes. Have you any knowledge that causes you to controvert their statement upon that point?

Secretary BAKER. I did not hear their statement, but I do not believe that it will be any such date before American-made planes are being used in France.

Senator NEW. That was their statement.

Senator REED. Do you mean American airplanes used in quantity before that date?

Secretary BAKER. Yes. Gen. Pershing has requested preferred shipments for a large number of De Haviland 4's in August, and reports we have here are that they are repairing the ones that they found possible to repair there and were intending to use this plane in combat. I assume that will be done.

Senator THOMAS. When did Gen. Pershing make that request?

Secretary BAKER. I can not give the date.

Senator THOMAS. Is that something recent?

Secretary BAKER. Yes; within two or three weeks, I should think.

Senator NEW. I would call your attention to paragraph 7 and subparagraph (a) of the Pershing cablegram of June 26. Paragraph 7:

None of the above planes can be used until some of the above changes are made, causing vital delay in the program.

Subparagraph (a):

Planes sent here must be inspected and thoroughly tested before being shipped.

In view of what Gen. Pershing says in these paragraphs, do you not think it was a very grave error to send forward machines of that type before those corrections were made?

Secretary BAKER. No, sir.

Senator NEW. That is all.

Senator THOMAS. Just one moment right there. I think it will be well to state in the record that Gen. Kenley, I think it was, stated that machines were sent over there before they were tested here by Gen. Pershing's request, the idea being they should all have been tested out completely here before they were consigned for shipment. If that is correct, it may be that those original shipments are due to the insistence of Gen. Pershing rather than the action of the War Department.

Secretary BAKER. If I may put this statement into the record, this will explain my answer to Senator New. The shipment of De Haviland 4 planes was inaugurated by sending a very few planes. They were tested at the fields in France, and a very large number of more or less minor defects were discovered in them, and some more or less fundamental changes were recommended. Those were the first few planes produced in this country. The policy has been adopted of testing about 1 out of every 10 planes as ordnance is tested, and it led to their sending over to France a number of others which had not been tested in this country by flyers before being sent.

When Gen. Kenley was put in charge of military aeronautics, he insisted that each machine ought to be tested in this country by flyers before being sent over, and that policy, I understand, is now being pursued. The De Haviland planes, which went over after the first consignment, had many of the minor defects pointed out by Gen. Pershing's associates, corrected and some of them had not. In my conversation with Mr. Potter and others about it I was informed that the facilities for making changes in the method of binding wires and things of that sort in the planes in France, were quite as good as they were here, and that the continuous shipment of the later De Haviland planes themselves, improved over the earlier

models, would enable Gen. Pershing's associates in France to put them in condition for combat flying, and so large numbers have been sent over, and they are being sent, the minor changes and betterments being made in them; and the last information I had was too obscure to base an opinion upon it, and so I express no opinion; but it rather led to the inference that some of them were being actually used.

Senator REED. If that is a correct statement of affairs, why is it that an order has been issued to stop shipment of these planes?

Secretary BAKER. I do not know that it has been issued.

Senator NEW. I was about to call attention to that.

Senator REED. Let me read you the following:

AUGUST 2, 1918.

The following telegram to be sent to Mr. L. E. Bauer, Aircraft Production District Office, Dayton; Maj. Rose, care of Standard Aircraft Corporation, Elizabeth, N. J.; Aircraft Production 31, Paterson, Detroit, Mich: Mr. Victor M. Tyler, Aircraft Production District Office, New York.

Also to senior inspectors at the Dayton-Wright and Fisher Body factories.

You are instructed to incorporate following number 1 changes in production of D. H. 4 planes; that is, no further machines are to be shipped without them. First, solder ends on all landing and flying wires must be wrapped with one-eighth inch spacing with seven-eighths to 1 inch solid wrapping between. All terminals shall be subjected to an inspection where 5 per cent of the ends are cut open and examined, also cut must show solid soldering. Second, the tubular brace between lower longerons and horizontal stabilizer is to be installed. Third, all control cable ends must be made with a splice of not less than four tucks and wrapped with twine. Fourth, intermediate ribs must be installed in the first panel of both upper and lower wings and the spacing of stitches and use of five-eighth-inch strip under stitches as per recent telegraphic instructions must be installed, each stitch secured by knotting and varnish dispensed with under fabric. Fifth, nickel steel bolt must be used in place of old taper pin securing the axle cap. Sixth, olive type of connection must be used on all rubber joints in the gasoline line. No more planes are to be shipped which do not include above changes. We realize that some of these are already in production. Wire me to-morrow the highest serial number shipped to-day. Further instructions will be sent you covering replacement on above machines already shipped. These instructions are in conformity with those of Capt. Roe.

AIRCRAFT PRODUCTION,
MIXTER.

Senator THOMAS. The statement of Gen. Kenley to which I referred is as follows:

In fact, we preferred to withhold the first 75 or 100 De Havilands to test here, but, due to the insistence of the authorities in France, they were sent over at once. Our test would probably have revealed the same defects.

Secretary BAKER. Yes.

Senator NEW. It is a fact that every flier that we have had before this committee as a witness, including several who have seen long service abroad both with our own forces, the British forces, and the French forces, has testified that the De Haviland-4 machine with the defects appearing in it as it has been produced at the Dayton-Wright factory is highly dangerous and ought not under any circumstances be used, and at least one officer has testified that he would no longer send men up from his field in a machine of that type until after these defects had been remedied. In view of that condition, as it has been expressed and recorded by the men who are best qualified to pass on the conditions and quality of that machine, I at least think that it was a very great error of policy and judgment to have sent

them forward before those mistakes were corrected, and I wanted to know whether or not you agreed with that view.

Secretary BAKER. The subcommittee, of course, has a great advantage over me in that I have not been permitted to see any of the testimony the committee has taken, so that I do not know anything about this concurrence of opinion to which you refer.

Senator NEW. I am telling you now what that opinion is.

Secretary BAKER. You are summarizing it, and of course I have no opportunity to know who the officers are who have testified or what their opportunity for observation was or what officers might say who have not been summoned; but this is one observation I can make in reply to your statement, that Gen. Kenley is himself an experienced flyer. His reorganization of the Bureau of Military Aeronautics is to equip it with flying men and that whatever has been done there has been the result of the judgment of expert flyers and of men who have a devoted interest in this subject, and while it may be open to the charge that it was a mistake of judgment, I feel quite certain that it ought to be fairly heard on both sides before such a judgment is regarded as final.

Senator FRELINGHUYSEN. Have you read the cablegram of Gen. Pershing?

Secretary BAKER. Yes.

Senator FRELINGHUYSEN. Do you consider the defects pointed by him to be minor?

Secretary BAKER. Some of them.

Senator FRELINGHUYSEN. Not all of them?

Secretary BAKER. I do not know enough about it; I am not an expert and I do not know the effect of many of the things described by Gen. Pershing.

Senator THOMAS. Gen. Kenley said, I think, that a majority of them were not vital; that some of them were important. I refer to paragraph 2.

The Liberty motor is defective. Indicating shop inspection not satisfactory. Lincoln apparently better than Packard.

Secretary BAKER. Now, that you read it, I remember that.

Senator NEW. To my mind, Mr. Secretary, there are very much more serious objections to machines than the one to which Senator Frelinghuysen has just called attention. I do not have the numbers of them, but they are included in this. One has reference to the weak condition of the stabilizers, another to the manner in which the wings are fastened to the fuselage, permitting the wires to pull out and thereby permitting the wings of course to double back on the body and come off, as they undoubtedly did in the case of the Patterson accident out at Dayton field, when that machine simply went to pieces in the air and that man rode down 15,000 feet on the fuselage without wings. They were evidently pulled out from that defect.

Secretary BAKER. I have heard the defect referred to, an improper method of fastening the wires. Of course, gentlemen, the questions that you are asking are not proper questions for me to try to answer. I am not a mechanic or a scientific man or an aeronautic expert. Such facts can be established only by experts.

Senator REED. But a good while ago the committee sent and asked for Gen. Pershing's report upon these points. It was refused us. We afterwards got the report from other sources.

Secretary BAKER. How?

Senator REED. We simply asked some Army officers if they had the report, and they got it.

Secretary BAKER. There is not the slightest objection to your having it.

Senator REED. Why was it not sent?

Secretary BAKER. The reason is that the communications from Gen. Pershing to the War Department are really confidential communications and they are available for the committee. The Secretary of War, Gen. Kenly, the Chief of Staff, are, all of us, perfectly willing to come down and answer any questions and give any information you want, but the whole character of communications between the commander in chief in the field and the War Department are essentially confidential.

Senator THOMAS. Afterwards we specified some cablegrams and those were sent.

Senator REED. The point I am making is not that. I do not understand how a committee of Congress, particularly the Committee on Military Affairs, can be refused documents relating to the condition of supplies, not relating to the finesse of the Army, the technical movements, but to the condition of supplies.

Secretary BAKER. Those telegrams you got.

Senator REED. We did not get them when sent for, and afterwards Senator Thomas says we got some, but I do not care anything about the other matter and I speak of it only because of the effect on the future. The point is this. This telegram of Gen. Pershing's was a complete demonstration, first, that this machine as being turned out and sent to him was a machine exceedingly dangerous and unfit for use; second, that a large number of these defects were the result of inexcusable recklessness or wantonness in manufacture.

Secretary BAKER. Failures in the inspection and things of that sort.

Senator REED. Failure of the manufacturer himself in the first instance to do a decent job, and, third, that they were defects which went with the matter of the design. What I am interested in is in knowing why that did not result in immediately stopping the production away back in June when this cablegram came until these defects were cured, particularly in view of the fact that scarcely a day was passing without somebody getting killed.

Secretary BAKER. Senator, I think I can answer. The defects pointed out by Gen. Pershing and discovered by observation and experiment everywhere were referred to the engineering section and to the production division, and instant directions were sent by telegram that in all future production beginning immediately they were to correct everything which was corrigible and the things which had caused the danger, like the pulling out of wires and the lack of inspection, were instantly corrected.

Senator REED. You just simply gave them directions.

Secretary BAKER. That is what we tried to do, whether we accomplished it or not.

Senator REED. You may have tried to do it, but, unfortunately, the record will show that somebody below you failed to do those things.

Secretary BAKER. No; I will tell you exactly what happened as far as I have any relation to it. The day that cablegram came I sent for Mr. Potter and Gen. Kenly, and had them in my office, and read the cablegram to them and directed them to make a report upon all those defects, and they made a report showing that some of them had been corrected before we received this cablegram. Others were immediately corrected, and then the question arose whether it would be better to go ahead with continued production and make the changes and repairs in the machines in France and install these fundamental changes in later machines, or whether to stop the whole program and make no more machines. The wisest thing was decided to be to let the machines go forward on the theory that these minor repairs and changes could be made and the machines could be used.

Senator NEW. Do you not know, as a matter of fact, that there is now at sea a force of American officers and artisans under charge of Col. Hall, who are on their way over there to make changes in these machines?

Secretary BAKER. Not essentially to make changes in these machines. The mission which Col. Hall has, and of the men who are going with him is, to establish a more immediate and direct contact between the fields here and there in working out of these defects and to bring back to us a closer view of what they discover in the use of the machine.

Senator REED. Do not think I ask this of you because you are a member of the Council of Defense, because I understand that the information bureau is part of it, but is it not time to stop Mr. Creel sending out his false statements and false pictures about aeroplanes?

Secretary BAKER. What have you in mind, Senator?

Senator REED. I have in mind a persistent campaign which he has made and which he has the insolence to try to back up; but I can epitomize it. There are many other things of this character in the Official Bulletin of March 28 of this year. He states:

A partial list of photographs released March 30 by the Division of Pictures, Committee on Public Information, herewith is presented. A complete list of all pictures may be had on application. Copies of these pictures may be obtained for private collections at 10 cents each by application to the Division of Pictures, Committee on Public Information, 10 Jackson Place, Washington, D. C., in writing. Order by number and inclose coin well wrapped. Stereopticon slides of photographs listed below may be obtained at 15 cents each. No. 6858. Aeroplane bodies, ready for shipment over there. These aeroplane bodies, the acme of the engineering art, are ready for shipment to France, though hundreds have already been shipped. Our factories have reached quantity production and thousands upon thousands will soon follow.

Now, the truth about that was that those were the pictures of a few training planes. The truth about it was that they were not the acme of the engineering art and the only thing we had to photograph in the world was some training planes.

Senator NEW. Not one of which either before or since has ever been sent to France.

Senator REED. Now, I read on:

No. 6859. The result of long experiments. Scientists and engineers have worked long in our aeroplane factories before perfection was attained, but now

that success has crowned their efforts, the factories have been put on a quantity production basis and many thousands of these efficient machines will be sent to France.

Secretary BAKER. The comment is on the use of the word "efficient"?

Senator REED. It says we have attained perfection.

Secretary BAKER. Of course, that is an improper word.

Senator REED. And that success has crowned our efforts.

Secretary BAKER. Most of those are terms which are relative and are matters of opinion. Perfection, of course, is not a matter of opinion, and it is an improper word.

Senator REED. The statement must strike you as——

Secretary BAKER. Unwarranted. Yes; it does.

Senator REED. I read on:

No. 6860. Speeding up aeroplane production. These cylinders for our perfect airplane engine are the product of the best engineers and scientists in this country and now that perfection has been finally attained, the engine factories have been placed on a quantity-production basis; huge amounts will be turned out to supply our ever-increasing force in France with motive power until victory is ours. No. 6861. Building airplane bodies. These carriages are models of efficiency and are built along the models furnished by the best engineers of this country. They are now being manufactured by the thousand and rushed to France to become part of our ever-increasing air force.

Secretary BAKER. That is true, except the perfection of the——

Senator REED. Except that they were perfect and except that they were being manufactured by thousands and rushed to France by thousands.

Senator FRELINGHUYSEN. Those were training planes to be used over here.

Secretary BAKER. If that applies to a training plane picture, it is a total misapplication of it. It states that planes are being manufactured by the thousands to send over by thousands; that is accurate.

Senator FRELINGHUYSEN. It is also true, Mr. Secretary, that instead of being efficient that with the exception of training planes there is not a single American combat plane on the front.

Secretary BAKER. That certainly was true at the time that was said.

Senator FRELINGHUYSEN. It was not there at the time this was said.

Secretary BAKER. It was not.

Senator FRELINGHUYSEN. There was not a single bombing plane at the time this was said.

Secretary BAKER. Of course not.

Senator FRELINGHUYSEN. And not a single reconnaissance plane on the front at the time this was said.

Secretary BAKER. Of course not.

Senator NEW. There had not been even a sample copy manufactured at that time.

Secretary BAKER. On March 28 there had not. I might say generally that I know nothing about these pictures. Describing the Liberty engine as perfect is wrong. The Liberty engine is a very excellent engine, and the British and French and everyone else want it in large quantities, and it is certainly the best engine ever made by machine tools in the history of the world; and it is probably as good as the Rolls-Royce. But it is not perfect.

Senator REED. I have a letter from Mr. Creel in which he denies the statement in the paper that he had sent out the pictures of Penguins as flying machines in France. There is the very picture that he sent out. [Handing a photograph to the Secretary.] And it is labeled on the back "American planes," as you will see. That is the original label placed on there.

Secretary BAKER. That does not say "American planes."

Senator REED. What does it say?

Secretary BAKER. Aviation. Planes at an American aviation field in France.

Senator REED. They are not aviation planes; they are Penguins that can not fly.

Secretary BAKER. I think that is straining the point, Senator.

Senator REED. He denied to me that he had sent out the pictures of Penguins as planes.

Secretary BAKER. Penguins are planes.

Senator REED. Do you think that any man representing this Government and sending out a propaganda such as I have read to you about our perfect planes and then put out a lot of pictures of these little Penguins with that sort of label is not engaged in deliberately trying to deceive the American public?

Secretary BAKER. I do not think your inference is justifiable.

Senator NEW. To be sure it does not say that these are "American planes."

Secretary BAKER. Nor does it say they are combat planes or fighters or anything else.

Senator NEW. It says that they are planes at an American——

Senator REED. They are planes that run on the ground used for beginners to practice with.

Senator NEW (reading). "Planes at an American aviation field in France." Is not the whole import of that misleading to the public? Do you not think it was intended to impress the public with the fact that those were American planes?

Secretary BAKER. I can not answer either of those questions. I can only say that as far as I am concerned its effect on me is that it is a truthful statement.

Senator REED. You do not think it was deceiving the public?

Secretary BAKER. I do not think so. It would not deceive me.

Senator REED. You would not know they were Penguins yourself if I had not told you.

Secretary BAKER. No, sir.

Senator REED. What do you think of sending this out?

No. 2939. The terror of the air. This Nieuport monoplane, the fastest machine in the world, and used extensively by the French in this war, has been loaned to our forces over there to chase and bag retreating German flyers.

The machine shown there is an old, slow, monoplane which has not been used by the French for two years, about, and is at least 40 miles an hour slower than the Spad or Nieuport plane.

Secretary BAKER. Of course, I do not know the facts about it, Senator, at all.

Senator REED. What would be the use of sending out to the public pictures of little Penguins? What is the object of that?

Secretary BAKER. The only part of this that appeals to me is that this does not say that this is an American-made plane. It does not say that this is a combat plane, but gives information in the language characteristic of these pictures, and this seems to be a harmless picture to me.

Senator REED. It is deceptive, because if the public had been told the truth it would say that it was a picture of three little machines that could not rise from the ground. They would not have been impressed with the fact that we were prepared over there to create devastation.

Senator NEW. The Penguin is not an advanced training plane, but it is a training plane, but it does not leave the ground.

Secretary BAKER. It is the A. B. C.'s of the business, the grasshopper type.

Senator REED. "No. 12470. Aviation. Planes at an American field, France." What would you get from that?

Secretary BAKER. I think that is a practically colorless description. It might be of any kind of planes.

Senator REED. But if it was coupled with the words "American aviation field," would you understand there was anything there except some French planes?

Secretary BAKER. In view of what has been stated in our newspapers; our papers have carried the story over and over again that there was nothing there except the French planes.

Senator REED. On the contrary, there was published in an American paper the statement that we had gotten in great quantity production and were sending over enormous quantities of planes, and that was followed by Mr. Creel's statement on March 28. Following those bombastic and false statements these pictures are shown to the public.

Secretary BAKER. They are all French planes.

Senator REED. Planes in an American aviation field.

Senator NEW. Yes; but they are all French training planes, and if you look at them closely you can see the French names on them.

Senator REED. As late as May 28 this picture was sent out, showing your picture over there where you are looking at those planes. Those certainly are French planes.

Secretary BAKER. Those are, certainly, and are labeled as nothing else.

Senator REED. I have the labels.

Senator NEW. I think it is perfectly plain that those pictures were issued by Mr. Creel's bureau with the express intention and purpose of misleading and deceiving the American public, and I think it is perfectly plain on the face of it that that was his intention.

Senator REED. Mr. Secretary, I have gone far enough. I can pursue this thing if it has not been completely demonstrated. Either wittingly or unwittingly this man has given the American public to understand that we had a great and successful air program. As a matter of fact, you know today and we know to-day that the aeroplane program up to this date is a conspicuous failure—a very sad fact, and one that we regret—and that the only thing we can do now is to put our best foot forward and try to remedy these evils.

I do not care that this thing be exposed more than need be, but I do think we ought to stop that sort of thing and we ought to go on and try to get some planes built, and I am calling attention to this not from any trifling reason but because I think the thing to do now is to tell the American people very plainly that they will have to abide with patience.

Secretary BAKER. I do not draw from those pictures the same inferences that you do. Mr. Creel did not know anything about aircraft. Mr. Creel had not had the advantage of sitting in with this committee. Pictures came to Mr. Creel showing aeroplanes in the air and on the ground. People told him that that picture would interest the American people and he issues the picture, and I think there is nothing in any of the descriptions which have been shown me beyond some language of hyperbole, and I think there is nothing indicating any intent on Mr. Creel's part to deceive the public.

Senator REED. Outside of the fact that he has not stated the truth.

Secretary BAKER. He has overstated the perfection of the Liberty motor and he has overstated the quantities of the machines undoubtedly.

Senator REED. And he has led the American public to understand that we have a vast number of machines over there, American machines. And he has been furnishing the American public with these pictures of French machines under the label "American aviation field," and when his attention is called to it he undertakes to defend it and to insist that it is true, and this country is to-day carrying these same pictures in the newspapers. Now, I think it ought to be stopped. I would rather stop it here than on the Senate floor, but it must be stopped.

Senator NEW. You say that Mr. Creel has not had the opportunity to sit in with this committee and hear the evidence which has been produced here. That is true, but it is also true that time and time again, repeatedly, have statements been made by the members of this committee to the effect that Mr. Creel's statements were untrue and were not supported by the facts. They have no further effect upon Mr. Creel, apparently, than to cause him to redouble his output and no attention has ever been paid to an authoritative word uttered by any member of this committee. Mr. Creel, apparently, at least, acts upon the statements made by people who do not know what they are talking about.

Secretary BAKER. With the greatest deference to you, I think you are unjust to Mr. Creel. The legends on those pictures are out of proportion. The words he uses imply quantities which do not exist, but a picture containing the phrase, "Planes at an American field in France," is absolutely and literally true, and to say that that deceives the American people because they will imagine that they are combat planes—

Senator REED. You must take that in connection with the statement which I read to you, that we have these fighting planes on the front, which preceded the sending out of these pictures. I am not

interested in it further than that I would like to know whether you sanction it or whether you do not sanction it?

Secretary BAKER. I will be happy to say to Mr. Creel that in dealing with the aircraft situation that all such words as "perfect" are misleading.

Senator REED. You dwell on the word "perfect," but he has dwelt on the word "quantity," and you have no quantity over there.

Secretary BAKER. We have some over there.

The CHAIRMAN. That will be all for to-day.

(Whereupon, at 1.30 o'clock p. m., the subcommittee adjourned to meet at the call of the chairman.)

PRINCETON UNIVERSITY,
Princeton, N. J., June 20, 1918.

MY DEAR MR. SENATOR: AS requested by your investigating committee I beg leave to submit the following report on the United States School of Military Aeronautics at Princeton University.

This school was established on July 3, 1917, at which time we entered into a contract with the Signal Corps to properly maintain and equip a school for the purpose of giving ground instruction to officers and enlisted men in training for the aviation branch of the service. The course of instruction at first was of eight weeks' duration, but later as the school developed and the scope of the work was broadened it was found advisable to lengthen it, and in April, 1918, the course was extended to 12 weeks.

Instruction is given in the following subjects: Aerial Observation, Gunnery, Gas Engines, Theory of Flight, Radio and Wireless, Aerial Tactics, and Military Studies.

For certain phases of the work it was necessary to design and equip the apparatus to be used in the instruction, as nothing of this kind had ever been attempted before—for instance, the miniature ranges used in the work of the department of aerial observation were planned, designed, and executed by our own instructors and mechanics. The same thing also applies to other lines of work. We were given an idea by the Signal Corps, and we in turn worked out the manner in which the instruction should be given and provided the equipment needed for it.

We have placed at the disposal of the Signal Corps the facilities of the university and have endeavored in every way possible to give a thorough course of instruction and make the school efficient in every detail.

The instruction is carried on in our two large laboratory buildings (Palmer Physical Laboratory and Guyot Hall, the geological and biological laboratory), and two additional laboratories constructed last winter for the work of the theory of flight and the gas engine divisions. It was found necessary to construct the latter two buildings when the school was increased to more than 600 students and the Signal Corps was considering a still further increase to 1,000.

The students are housed in three large dormitories, which have been turned over for the exclusive use of the school as barracks. These buildings are very conveniently located to the laboratories in which the instruction is given and also to the drill grounds.

Two sections of our large new dining halls have been assigned as mess halls, and this very important feature in the life of the men is most carefully looked after in a thoroughly hygienic and sanitary manner.

For the maintenance of this school, exclusive of the mess halls, we were paid \$60 for the instruction of each student on an eight weeks' basis, and are now being paid \$80 on the 12 weeks' basis. The total tuition received from the opening of the school July 3, 1917, to June 1, 1918, is \$112,954.97. The amount expended during the same period is \$139,625.80, leaving a net debit balance of \$26,670.83. Provision has been made to reimburse the university for this deficit, and the new contract prepared for the second year's operations, beginning July 1, 1918, has made provision for carrying on the school without loss to the university.

It was a great pleasure to me to meet you and your colleagues in Princeton on Tuesday. I was disappointed, however, that you were not able to remain for luncheon.

If there are any further particulars which you or the members of your committee wish to know will you kindly inform me.

With assurances of my highest personal regard, believe me,

Faithfully, yours,

JOHN GRIER HIBBEN.

Senator C. A. THOMAS,

Chairman Committee on Military Affairs,

Washington, D. C.

AIRCRAFT PRODUCTION.

TUESDAY, AUGUST 13, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 3 o'clock p. m. in the committee room, Capitol Building, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

The CHAIRMAN. We will hear Mr. Ryan this afternoon.

STATEMENT OF MR. JOHN D. RYAN, DIRECTOR OF THE BUREAU OF AIRCRAFT PRODUCTION.

Senator REED. Mr. Ryan, before you became connected with the aircraft service of the Government, what was your business and life?

Mr. RYAN. My principal occupation was president of the Anaconda Copper Mining Co.

Senator REED. You never had any experience in manufacturing?

Mr. RYAN. Well, no; except in so far as manufacturing goes with mining and metallurgy, as it does to a considerable extent. I mean that we have big shops—machine shops, pattern shops, and foundries—and all that kind of thing. To that extent only have I had anything to do with manufacturing.

Senator REED. That, of course, was confined to production for your own business?

Mr. RYAN. No; we had an incidental business, supplying the mining machinery, and that kind of thing, for the northwestern country. We carried on that manufacturing for others as well as ourselves.

Senator REED. But you never had anything to do with aircraft production, did you?

Mr. RYAN. No.

Senator REED. What is the position you now hold, Mr. Ryan?

Mr. RYAN. It is a dual position, in a way. Under the President's order of May 20, under the so-called Overman Act, I have been made director of the Bureau of Aircraft Production. I mean by that that the bureau was created by the President's order of May 20, and under that order, by virtue of my holding the position of chairman of the Aircraft Board, I became director of the bureau. I hold both those positions.

The CHAIRMAN. At 50 cents per year apiece? [Laughter.]

Mr. RYAN. I would not swear to that. I have not collected any money, and a man never knows what his wages are until he has collected.

Senator REED. Who comprise the Aircraft Board?

Mr. RYAN. The Aircraft Board consists of three civilians—the chairman, Mr. Richard F. Howe, and Mr. W. C. Potter.

Senator REED. Those are the three civilians—Ryan, Howe, and Potter?

Mr. RYAN. Yes, sir; the three members representing the Navy are Admiral Taylor, Capt. Irwin, and Commander Atkins. The three members representing the Army are Gen. Kenly, Col. Deeds, and Col. Montgomery; the latter two being detached from duty and not acting as members of the board; but, as I understand it, not removed.

Senator REED. This composes the Aircraft Board?

Mr. RYAN. Yes, sir.

Senator REED. Where is Col. Deeds now? You say that he is detached?

Mr. RYAN. I do not know. He has not attended a meeting of the board for some time.

Senator REED. He is in the Government service somewhere, though?

Mr. RYAN. Not so far as I know. So far as I know, Col. Deeds has no connection with the bureau of aircraft production; and, of course, outside of that I have no knowledge.

The CHAIRMAN. He still holds a commission in the Army, and is a member of the board?

Mr. RYAN. He is a member of the board; but, being detached, he is not acting as a member of the board.

Senator REED. I was wondering whether he was detached and sent to some other place.

The CHAIRMAN. I think I can inform you about that. My understanding is that he was detached, as was also Col. Montgomery, and that they were placed at the disposal of Mr. Hughes and his committee, pending their investigation.

Mr. RYAN. I can say that as to the order detaching them from their duties, after it was issued by the Secretary of War, that Col. Montgomery never appeared at any meeting of the board; or, so far as I know, never performed any act or did anything as a member of the board. Col. Deeds did come to two meetings. At the second meeting I told him it was my impression that the order detaching him detached him from activity and should prevent his taking any action on the board. He never came to a board meeting after that. That was some time in June.

Senator REED. That, I think, would be very natural.

Mr. RYAN. That is my construction of the order.

Senator REED. Certainly.

The CHAIRMAN. That is the proper construction.

Senator REED. When was the order of detachment issued?

Mr. RYAN. I do not remember the date.

Senator REED. Could you approximate it?

Mr. RYAN. No; I could not.

The CHAIRMAN. It was about the time that the Hughes commission was requested to conduct the investigation.

Senator REED. What has become of Col. Montgomery?

Mr. RYAN. I have not seen him.

Senator REED. Do you know whether it is true that he is on the General Staff now?

Mr. RYAN. I do not know. He has never appeared in our work, so far as I know, and outside of that, I have no knowledge.

Senator REED. I want to come now to another point.

Mr. RYAN. I will say this. So far as I know, Col. Montgomery, from the date that he was detached, just walked out of the office, and I do not believe he has performed any service of any kind in connection with aircraft production since. He has never appeared in any way.

Senator REED. Was Col. Montgomery a civilian before the war?

Mr. RYAN. I believe he was. I never knew him until I came down to take up this work.

Senator REED. Will you kindly give us the personnel of the Bureau of Aircraft Production, of which you are director?

Mr. RYAN. I am director; Mr. Potter is my assistant, with the title of assistant director, and Mr. C. W. Nash is assistant to the director in charge of engineering and production.

Senator REED. Will you let me get that now. You say that you are director. That means that you are a general director?

Mr. RYAN. So I understand.

Senator REED. Potter is assistant?

Mr. RYAN. Assistant to me: yes, sir. He is assistant director with general duties as my assistant. I have said, without making a definite order to that effect. "You must consider me and Mr. Potter as one man. In my absence Mr. Potter speaks for me, and any act of Potter's is my act. Mr. Nash acts as assistant to the director in charge of engineering and production.

Senator REED. You spoke of a Mr. Howe?

Mr. RYAN. Yes, sir.

Senator REED. What is his position?

Mr. RYAN. He is a member of the Aircraft Board. He is not in the Bureau of Production.

Senator REED. Then we have Mr. Nash, and he is assistant director?

Mr. RYAN. No; assistant to the director in charge of engineering and production.

Senator REED. Now, will you let me follow the personnel of these boards? Take the Aircraft Board. You have already stated that you were not an aeroplane man. Was Mr. Potter experienced in aircraft production before he joined or was made a member of the board?

Mr. RYAN. Mr. Potter had been chief of the equipment division of the Signal Corps since February, I think, and was made a member of the Aircraft Board in—

Senator REED. February, 1918?

Mr. RYAN. Yes, sir; and was made a member of the Aircraft Board in July.

Senator REED. He had that much experience?

Mr. RYAN. Yes, sir.

Senator REED. Mr. Nash had never had any experience in aircraft?

Mr. RYAN. Mr. Nash had been engaged in the motor-car manufacturing business, as president of the General Motors Co. and of the Nash Motor Corporation, and probably had as large a general experience in motor-car manufacture as anybody in the country.

Senator REED. Automobile motors, you mean?

Mr. RYAN. Yes, sir; automobile motors.

Senator REED. The Navy is represented on the Aircraft Board by Admiral Taylor. Had he had any experience in aircraft?

Mr. RYAN. I do not know.

Senator REED. How about Capt. Irwin?

Mr. RYAN. I do not know what his experience is.

Senator REED. How about Commander Atkins?

Mr. RYAN. I do not know as to any of them. I never knew any of them until I came here. Yes; I did know Atkins as a boy. He came from Butte, which is my town, but I do not know as to his experience with aircraft or aviation.

Senator REED. Gen. Kenly, we all understand, has been an experienced man in aviation.

Mr. RYAN. He was put on the board to succeed Gen. Squier when he was put in the position of Chief of the Department of Military Aeronautics.

Senator REED. Who is Mr. Landon?

Mr. RYAN. He is in charge of production.

The CHAIRMAN. Under Mr. Nash?

Mr. RYAN. Under Mr. Nash; yes, sir.

Senator REED. He was also in charge of that before Mr. Nash was appointed?

Mr. RYAN. He was in charge of that before Mr. Nash was appointed.

Senator REED. When did he get in charge of production first?

Mr. RYAN. About the latter part of May.

Senator REED. When did Mr. Nash come in?

Mr. RYAN. About 10 days ago—no; three weeks ago.

Senator REED. That would be practically the 25th of July?

Mr. RYAN. About the middle of July.

Senator REED. What had been Landon's business before he took this position?

Mr. RYAN. He had been vice president in charge of production of the American Radiator Co.

Senator REED. He is that now, is he not?

Mr. RYAN. I do not know whether he has resigned or not.

Senator REED. Had he ever had any experience in aviation?

Mr. RYAN. He had some connection with the Aircraft Board a year ago, or some such matter, and he severed his connection with them the last of October or in November.

Senator REED. You do not know of him having practical experience in aviation or the production of flying machines?

Mr. RYAN. I do not know.

Senator REED. You are the director of the Bureau of Aircraft Production?

Mr. RYAN. Yes, sir; I am.

Senator REED. I assume that when we use the term "director" in this instance, it means that you are manager and controller of the Aircraft Production Board, and whatever you say goes.

Mr. RYAN. I would not say "controller." "Controller" is often used in another way. I am afraid we might confuse it. You might say I am the man who controls the production of aircraft for the Army.

Senator REED. That is, you mean to say that you are the man who controls; in other words, this board, which is called the Aircraft Production Board, of which you are the director, and which is composed of Ryan, Potter, Taylor, Irwin, Atkins, and Kenley, is under your direction?

Mr. RYAN. Not at all. That is an advisory board. It has nothing to do but advise. It has no function but an advisory one in the production of aircraft. The Bureau of Aircraft Production is the arm of the Government that is responsible for the production of aircraft.

Senator REED. Now, the Bureau of Aircraft Production is composed of yourself as director and——

Mr. RYAN. Yes; I am director.

Senator REED. Which means that you are the head and that you control the aircraft production, and that the other members who have been named, or persons who have been named, work under your direction?

Mr. RYAN. I so understand; yes, sir.

Senator REED. So that Potter and Nash simply are assistants to you?

Mr. RYAN. Yes, sir.

Senator REED. That is correct, is it?

Mr. RYAN. Yes, sir; as their titles would indicate.

Senator REED. That organization which you have created in that way for the purpose of carrying out the functions and duties that are imposed upon you has a number of other employees, I assume?

Mr. RYAN. That organization?

Senator REED. Yes. You have a number of other employees?

Mr. RYAN. Yes, some hundreds of them.

Senator REED. I will come to that in a moment. Now, I want to go back to the Aircraft Board.

Senator THOMAS. Just a moment, if I may interrupt. As I understand the situation, the Aircraft Board was the institution which had charge of production until the Bureau of Aircraft Production was created by Executive order, and you were placed in charge of it.

Mr. RYAN. That is not strictly true, Senator. The Aircraft Board, if you take pains to read the act creating it, you will see is purely an advisory body. It never had any other power, and the equipment division of the Signal Corps occupied the place that to-day is occupied by the Bureau of Aircraft Production; that is, it was a body that was responsible for the production of aircraft. The board was advisory purely.

The CHAIRMAN. Then there were two advisory boards—the advisory association of which Durand was chairman and the Aircraft Board?

Mr. RYAN. That was an advisory association connected with the Council of National Defense?

The CHAIRMAN. Yes; but created by statute.

Mr. RYAN. The Aircraft Board is the only advisory body that I know of that was engaged in this work prior to my coming in.

(Informal discussion followed which the reporter was directed not to record.)

Senator REED. What I want to do, Mr. Ryan, in the briefest possible way, is to arrive at the control of aircraft production as it now exists. Now, there was a National Advisory Committee for Aeronautics at one time. That was composed of whom?

The CHAIRMAN. Mr. Durand was chairman. Then there was Dr. Walcott.

Senator REED. I want to get them in the record, and also when that was created, if anybody knows.

Mr. RYAN. I have not the date.

The CHAIRMAN. It was created by the act of March, 1917, I think.

Senator REED. Does anyone know what the law is under which it was created?

Senator FREINGHUYSEN. I think it was created under the national-defense act.

The CHAIRMAN. It was earlier than that.

Mr. RYAN. I am not certain about it, but my recollection is—

Senator REED. It was composed, I see here, of Prof. Ames; Col. Clark, of the United States Army; Prof. Hayford; Prof. Marvin; Hon. Byron R. Newton; Prof. Pupin; Maj. Gen. Squier, United States Army; Rear Admiral Taylor and Lieut. Commander Towers, of the Navy. Director Charles D. Walcott was chairman of the executive committee, and the secretary was Dr. S. W. Stratton, while the special secretary and disbursing agent was John F. Victory.

I assume you can not tell us the date when this Advisory Committee for Aeronautics was created, but it preceded your connection with the aircraft business?

Mr. RYAN. It did; yes, sir.

Senator REED. Now, I am going, if possible, at the risk of repetition, to clear up what seems to be a matter of doubt. There was also at the time that you became connected with the Aircraft Production Board some sort of other board that was engaged in a general way in managing the production of aircraft, was there not?

Mr. RYAN. There was a board known as the Aircraft Board.

Senator REED. Yes. That Aircraft Board is the one that you have just described as having upon it Admiral Taylor, Capt. Irwin, Capt. Atkins, Gen. Kenly, Col. Deeds, and Col. Montgomery.

Mr. RYAN. Yes, sir; and Mr. Howe and Mr. Potter and myself.

Senator REED. I am speaking of this board. It existed before you became a member, did it not?

Mr. RYAN. It did.

Senator REED. I am trying to get the civil members of the board at the time.

Mr. RYAN. Howard Coffin was chairman, and then there were Mr. Howe and Mr. Thayer.

The CHAIRMAN. May I interrupt just a moment?

Senator REED. Just let me finish this, if you please. Now, when you came into this business, you took the position that Coffin had formerly held?

Mr. RYAN. On the Aircraft Board.

Senator REED. On the Aircraft Board; and Mr. Potter took the position that Mr. Howe had formerly held?

Mr. RYAN. No. Mr. Howe still retains membership on the board. Mr. Potter was appointed in July to fill a vacancy created by the resignation of Mr. Thayer, whose resignation was in the President's hands when I accepted the chairmanship, and was accepted about the time I was appointed.

Senator REED. So that Potter was then and still remains upon the Aircraft Board?

Mr. RYAN. He was not on the board until July.

Senator REED. When did you come in?

Mr. RYAN. About the 1st of May.

Senator REED. Well, then, who was on it.

Mr. RYAN. I think my actual appointment was confirmed by the Senate later, some time around the 10th or 15th of May. My appointment was announced about the 1st of May.

Senator REED. What I am trying to get at is who were the civilian members at the time you came. One was Coffin, whose place you took.

Mr. RYAN. I took his place. One was Mr. Howe, who still retains his membership, and there was Mr. Thayer, who resigned before I came in and whose resignation created a vacancy which was filled by Mr. Potter.

The CHAIRMAN. I find that that advisory committee was created by the naval bill approved March 3, 1915.

Senator REED. This Aircraft Board was doing something when you took your position upon it, was it not?

Mr. RYAN. Yes.

Senator REED. What was it doing; what had it been doing?

Mr. RYAN. As I have read the minutes of the Aircraft Board to familiarize myself with the history of the board and the whole aircraft production plan, the Aircraft Board was passing upon contracts that had been negotiated and authorizing negotiations looking toward contracts—not authorizing, but approving in a way and generally considering in their sessions questions relating to the production of aircraft.

Senator REED. It really had charge, did it not, of the whole production of airplanes?

Mr. RYAN. I have never so construed it, and I have never treated it as though it did have charge.

Senator REED. Who did have charge?

Mr. RYAN. The Equipment Division of the Signal Corps.

Senator REED. At the time you came in?

Mr. RYAN. The Equipment Division of the Signal Corps had charge of the actual contracting, production, and purchase of aircraft.

Senator REED. So that we had, then, a civil board, or a statutory board—I will use that term—composed partly of civilians and partly of the officers of the Army and Navy, who recommended contracts, or supervised contracts, and all that sort of thing, but the actual contracting was done by the Equipment Division of the Signal Corps?

Mr. RYAN. In so far as Army aircraft was concerned.

Senator REED. By whom on behalf of the Navy?

Mr. RYAN. By the Navy. I do not know just who.

Senator REED. As a matter of fact, though, did not this Aircraft Board really dominate and control in the matter of the contract, so far as the Army was concerned?

Mr. RYAN. That would be a matter of opinion, Senator. I do not think you want my opinion.

Senator REED. I thought it was a matter of fact.

Mr. RYAN. No; it is not a matter of fact. It would be a matter of opinion whether it did or not.

Senator REED. This Aircraft Board still exists?

Mr. RYAN. Yes, sir.

Senator REED. What is its function; what is it doing now?

Mr. RYAN. Its function, as it is exercised now, is to meet and discuss matters relating to aviation. For instance, the advisability of entering into a contract for engines, the advisability of contracting for aeroplanes, the advisability of adopting types after engineering work has been done and recommendations are made. Recommendations are made and they pass approval or disapproval upon them.

Senator REED. But they have no power to contract?

Mr. RYAN. No power to contract.

Senator REED. No power to produce?

Mr. RYAN. No power to produce.

Senator REED. And no power to spend money?

Mr. RYAN. No power to spend money except for their own expenses.

Senator REED. And their opinion in regard to any matter is purely advisory to whom?

Mr. RYAN. I would consider that approval or disapproval of the Aircraft Board was not binding in any sense upon me, if I were to do any certain thing with respect to aircraft production.

Senator REED. Then we get to this point: While we have the Aircraft Board, and while you have your various assistants, in the office you call the Bureau of Aircraft Production, you are master of the situation.

Mr. RYAN. I understand you, I think. I so construe my duties.

Senator REED. You decide the question ultimately?

Mr. RYAN. I so construe my duties; yes, sir.

Senator REED. It appears from your previous answer that the Equipment Division of the Signal Corps at one time had the ultimate say as to whether a contract should be entered into, or if certain things should be done.

Mr. RYAN. I think so.

Senator REED. Do I understand that those functions and powers have been transferred to you?

Mr. RYAN. They have been definitely transferred by the order of the President of May 20, creating the Bureau of Aircraft Production.

Senator REED. Then, whatever Col. Deeds, if he were restored to the active list, might recommend, or whatever Col. Montgomery, if he were restored, might recommend, or Gen. Kenly might recommend, would only be advisory, and you would be the man to determine and answer the problem, whatever it is; is that right?

Mr. RYAN. I would so construe my authority; yes, sir.

Senator REED. Do you know who was on the Equipment Division of the Signal Corps at the time you were appointed to your present position?

Mr. RYAN. Mr. Potter was the chief.

Senator REED. And who else that you know was on it?

Mr. RYAN. Well, they were all under him. He was the chief. There were a number of individuals in charge of the different departments, but he occupied the position of chief of the Equipment Division.

Senator REED. Were Col. Deeds and Col. Montgomery and Col. Aldon also upon that Equipment Division?

Mr. RYAN. I do not know of any official connection that they may have had with the Equipment Division. That may not be true. They might have been officially connected with it, but not to my knowledge.

Senator REED. My understanding is, Mr. Ryan, that these men I have just named, or some of them, at least, had a great deal to do with the matter of making contracts. I am trying as hard as I can to find out who is responsible for this condition which existed at the time that Mr. Potter took charge.

Mr. RYAN. Senator, I will be very frank to tell all I can.

Senator REED. I know that.

Mr. RYAN. I will say this: When I took charge, when the President's order of May 20 creating the Aircraft Production Bureau was issued, I was made director, and in so far as possible I wiped the slate clean and started with a new organization chart. I took Mr. Potter out. I took over the whole Equipment Division of the Signal Corps and put Mr. Potter, who was then in charge of the Equipment Division, with me as assistant in the Bureau of Aircraft Production. The work of the Bureau of Aircraft Production entirely covered the scope of the work of the Equipment Division, but I did not go back of that to find out what position and what authority each individual had, but relied upon Mr. Potter to work out the organization which we have worked out to carry on the work from that date.

The CHAIRMAN. Whom did Mr. Potter succeed as head of the Equipment Division?

Mr. RYAN. I would not state it as a fact, but it is my impression he succeeded Col. Deeds.

(At this point informal discussion occurred.)

Senator REED. Mr. Ryan, you took over the various forces that you had on hand to a large extent, did you not?

Mr. RYAN. I took over the Equipment Division of the Signal Corps. That was the principal force.

Senator REED. How many men were there in that division?

Mr. RYAN. There were hundreds. I do not know just how many.

Senator REED. Who were the leading men besides those you have named?

Mr. RYAN. Mr. Potter was chief. Mr. Kellogg was his assistant. Maj. Wolff, I think, was in charge of the finances; Maj. Brown was assistant. Mr. Fletcher was in charge of purchases and contracts. Maj. Downey was in charge of disbursements. Mr. Lockhart was in charge of raw materials. Col. Mixter was in charge of production. Maj. Leadbetter was in charge of the supply of wood. I think those were the principal activities.

Senator REED. How many were Regular Army officers and how many were civilians who got into Army uniforms?

Mr. RYAN. I can not say positively. I am not sure, but I think Maj. Downey was the only Regular Army officer in the list I have mentioned.

Senator REED. The rest were civilians?

Mr. RYAN. Yes, sir.

Senator REED. Mr. Potter came in from civil life?

Mr. RYAN. Yes, sir.

Senator REED. What was his occupation or business before he came in?

Mr. RYAN. He was in the mining and metallurgical business and connected with the Guggenheims.

Senator REED. And never had anything to do with aircraft?

Mr. RYAN. I think not.

Senator REED. What was Mr. Kellogg's business?

Mr. RYAN. Mr. Kellogg was a manufacturer. I do not know just what he manufactured, but I think he was a metal manufacturer. I do not know exactly what line.

Senator REED. Was he an automobile man?

Mr. RYAN. I think not. He might have made parts for automobiles, but he was not an automobile manufacturer.

Senator REED. Mr. Mixer was in charge of production you say. Who was he?

Mr. RYAN. He is connected with one of the plow companies. I think. I believe it is the John Deere Co. or one of the harvester companies. I do not mean the harvester company, so called, but one of the companies manufacturing harvesting machinery.

Senator REED. Mr. Wolff was in charge of finances. Who was he?

Mr. RYAN. I think he was a certified public accountant.

Senator REED. And Mr. Lockhart?

Mr. RYAN. I really do not know what his business was.

Senator REED. And Mr. Leadbetter?

Mr. RYAN. I do not know what Maj. Leadbetter was.

Senator REED. How about Mr. Downey?

Mr. RYAN. I think Maj. Downey was a Regular Army officer.

Senator REED. There was not a single one of these men who had had experience, so far as you know, in aircraft production?

Mr. RYAN. Not so far as I know.

Senator REED. They were men that you think actually had the final say in regard to contracts before you took charge?

Mr. RYAN. Subject, of course, to Gen. Squier, who was Chief of the Signal Corps. They were all under him.

Senator REED. Yes. Do you know how much money, approximately, had been expended at the time you took charge in the production of aircraft? When I say "expended," Mr. Ryan, I mean actually paid out or that the Government obligated itself to pay out.

Mr. RYAN. The actual expenditure, up to the time I took charge was something like \$350,000,000.

Senator REED. Do you include in that the commitments?

Mr. RYAN. No; the actual expenditures. The commitments beyond that were sufficient to absorb all of the appropriation that had been made the year before, of \$640,000,000. However, a good part of

these commitments or a considerable part of these commitments, over and above actual expenditures, were for things for which they would be reimbursed. For instance, take the production of things for the allies and that the Equipment Division would be reimbursed for when they completed deliveries on work that they were doing, principally for the allies. But the commitments plus the actual expenditures had reached a total of the appropriation of the year before, so that I was unable from the time I took hold until the new appropriation bill passed to authorize or approve any contracts for material.

Senator REED. You asked for a new appropriation and got it, did you not?

Mr. RYAN. Yes, sir.

Senator REED. How much was it?

Mr. RYAN. The appropriation asked for was a lump appropriation to cover the Department of Military Aeronautics and the Bureau of Aircraft Production. It was \$1,032,000,000.

Senator REED. The new appropriation?

Mr. RYAN. Yes. That was afterwards subdivided between the two departments.

Senator REED. And \$640,000,000 would make \$1,672,000,000 that has been appropriated up to this date for aircraft?

Mr. RYAN. That has been appropriated up to this date to carry us until June 30 of the next year.

Senator REED. What are the Government's commitments and expenditures up to this time, as nearly as you could tell?

Mr. RYAN. I have not got them accurately. I have been away four weeks, and I have not got them accurately. I would not like to state it. I can get it for you later.

Senator REED. I wish you would do that and insert it in the record. What I want to get at is an accurate statement in regard to the expenditures and commitments as they existed at the time you came in. You say there was an actual expenditure of \$350,000,000?

Mr. RYAN. About that.

Senator REED. In round numbers?

Mr. RYAN. Yes, sir.

Senator REED. And there were commitments?

Mr. RYAN. For approximately \$300,000,000 more.

The CHAIRMAN. Has not Mr. Potter furnished that?

Mr. RYAN. I think that information was furnished by either Mr. Potter or Mr. Brown.

Senator REED. Now, you said that a part of the money on these commitments would come back by virtue of the fact that we were producing certain things for other countries who would pay us in return for it, and we were also producing for the Navy?

Mr. RYAN. Yes, sir.

Senator REED. How much would come back altogether?

Mr. RYAN. I do not know, sir.

Senator REED. Can you approximate it?

Mr. RYAN. No, sir.

Senator REED. Can you get it for us?

Mr. RYAN. I think I can get it for you. I think I can get it as of June 30.

Senator REED. That is about the time.

Mr. RYAN. I think I can get it.

Senator REED. Will you give us all the figures as of June 30?

Mr. RYAN. Yes, sir.

Senator REED. That is, give all the figures as of a certain date.

Mr. RYAN. Yes.

Senator REED. What I want to get is an actual statement of the amount of money that our Government had paid out or committed itself to pay or, net, so that you may deduct any money that would come back from other sources than our own Government.

Mr. RYAN. Wouldn't you say including moneys that would come back from the Navy as well as other countries?

Senator REED. It is all right to state it that way, but what I am trying to get at is how much of this money this Government expended or committed itself to expend in order to get aircraft production. If it has made some for foreign countries and the money comes back, of course, we are not out that money, but if we are doing work for the Navy, even though it comes back from their appropriation, it simply means that it is being taken out of one hand and put into another. It is the Government's money. I want to get at the amount of money that this Government has spent on aircraft.

Mr. RYAN. This thing would have to be taken into consideration and could not be shown. For instance, we are entering into large contracts for engines. A large part of them, for foreign governments. A large part is for the Navy. Now, what proportion of the initial expenditures that were made in order to get that engine production going and finally to be reimbursed, would be impossible to determine, because we could not determine what proportion of the engines were finally going to be delivered. We do not know how many are going to be delivered to the allies or anybody.

Senator REED. That is what I want to get at. I want to find out how much Uncle Sam is out of pocket for airplanes, or was at the time you took charge. It is not a matter of bookkeeping with me at all; it is a matter of plain, practical, common sense. Let me put it this way: There is a Treasury down there which belongs to the people of the United States. It was filled up by the taxpayers of the United States. We have taken a lot of money out of it. We have expended it in aircraft; we have obligated ourselves for a lot more money. Now, as to any money that is going to come back to us from foreign governments, I want to know about, but I do not consider it as an expenditure in the sense I am now speaking of. On the other hand, any part of that money that Uncle Sam has to pay, either out of this appropriation or out of another appropriation for the Navy, is a Government expenditure, and I want to know the amount. I think your statement will show that, will it not?

Mr. RYAN. Of course, I want to give you all the information I can, because it is nothing that could reflect on me one way or the other, because it antedated my connection. I will say this, however, if you want that clearly and concisely stated, so that you can best have it before you, I think it would be very much better to get it from the Chief of the Finance Department than to attempt to get it from me, because he has the figures.

Senator REED. I have had a table that is so complicated that I do not intend to study it during this hot weather.

Mr. RYAN. Working out that thing I would perhaps only complicate it further, and the man who is responsible for doing that can certainly clear it up to your satisfaction better than I can.

Senator REED. The people of the United States are interested in how much they are out of pocket for these airplanes, or were out of pocket at the time you went in. At least, we can arrive at this point, that there were \$350,000,000 paid out and expended, and there have been commitments which have absorbed \$640,000,000, and we are in such condition that in order to carry on the airplane program for the next fiscal year you have asked and been given a further appropriation of \$1,032,000,000?

Mr. RYAN. That includes not only the appropriation for aircraft production, but the appropriation for military aeronautics. That is to pay for flyers and mechanics and everybody beyond the point of production.

Senator REED. Will you give us a statement of how much of that goes to production?

Mr. RYAN. Yes, sir. Maj. Brown can get that accurately.

Senator REED. When you came in after this vast sum of money had been expended, or we had made these commitments for this other vast sum of money, you found that the Government had some considerable number of training planes of American make, did you not?

Mr. RYAN. Yes, sir.

Senator REED. I suppose that you have not in mind the number of those training planes?

Mr. RYAN. I could not give it accurately. I think I can get it for you. I can give it to you to date.

Senator REED. How is that?

Mr. RYAN. I can give it to you to date.

Senator REED. I would very much rather have it up to this date that you speak of.

Mr. RYAN. Well, then, probably I had better give it later.

Senator REED. If you haven't got it here, give it to me to date.

Mr. RYAN. Six thousand three hundred and fifty-nine.

Senator REED. Those were all training planes, and were generally of what types; what were the principal types?

Mr. RYAN. The J. 1, 1,600; the J. N. 4D, 3,195; the J. N. 4H, 1,235; the S. 4, 233; the Penguin, 90; the M. Defense, 6.

Senator REED. What has become of the Standard?

Mr. RYAN. They made some of these. They made some of the J. 1 and they made some of the J. N. 4D.

Senator REED. Oh, that is the Standard J. 1?

Mr. RYAN. The Standard Aircraft people made 750 of them, I think.

Senator REED. Generally speaking, you found the situation with reference to the number of planes and with reference to the capacity for the training planes, was not bad, did you not?

Mr. RYAN. I would consider that at the time I took hold the number of training planes, elementary-training planes, was entirely sufficient.

Senator REED. How was it about the advanced-training planes?

Mr. RYAN. The advanced-training planes were somewhat backward.

Senator REED. How were you situated with reference to the advanced training planes? Did you include them in the number you have given?

Mr. RYAN. Yes, sir. They are included in that—that is, what we called at that time advanced training planes.

Senator REED. What did you call at that time advanced training planes?

Mr. RYAN. The J. N. 4H was as advanced a training plane as we had at that time.

Senator REED. Yes; but you found that while they called them advanced training planes, they were, in fact, not suitable for that work?

Mr. RYAN. Well, they were as suitable, I think, as anything else up to that time. I do not think there was anything anywhere, perhaps, that would be considered better for advanced training up to that time. There has been a marked change in the requirements for advanced training planes in the last two months.

Senator REED. Since May, 1918?

Mr. RYAN. Yes, sir; since then.

Senator REED. With the exception of these advanced training planes, you did not have a single plane at the time you became connected with aircraft production that would now be regarded as an advanced training plane, did you?

Mr. RYAN. Well, I still think that we would still consider the J. N. 4H as an advanced training plane.

Senator REED. You had 1,235 of those?

Mr. RYAN. Yes, sir.

Senator REED. That, of course, is utterly inadequate to supply the present needs of the country?

Mr. RYAN. I think it is inadequate. I think we need more than that.

Senator REED. What was the condition at the time when you became connected with the board with reference to fighters?

Mr. RYAN. By that you mean not combat planes, but strictly fighters?

Senator REED. I mean a fighting plane.

Senator NEW. You mean a combat plane.

Senator REED. I mean a plane used to fight with.

Mr. RYAN. Fight or bomb?

Senator REED. I mean a plane used to go out and fight another man with.

Mr. RYAN. So that we may not be confused, the so-called fighter is a small, light, fast, maneuverable machine.

Senator REED. That is what I mean.

Mr. RYAN. The only fighter that was on the way, as far as I know, at the time I took hold, was the Bristol fighter, which was an adaptation of the English machine in an endeavor to utilize the Liberty motor in it.

Senator REED. What was the situation with reference to the Bristol fighter when you took hold?

Mr. RYAN. I am afraid I have not the actual number contracted for. The trouble with my figures is that the statistics that I brought and that I thought you would want to question me about are statistics up to date, and not those that you want. The Bristol fighters num-

ber, as I recall it, was 2,000. There was a contract with the Curtiss Co. for 2,000 Bristol fighters. They commenced production. They had turned out, I think, three or four planes that upon trial developed defects.

Senator REED. You say that they were in production and that they turned out three or four machines?

Mr. RYAN. Yes.

Senator REED. But didn't that involve the utilization of a very large part of their factory that covers 22 acres?

Mr. RYAN. It did.

Senator REED. In the preparation of parts of these machines and in the employment of thousands of people?

Mr. RYAN. It did.

Senator REED. When you say three or four had been produced, that means that many finished planes had been turned out and there were a great many partly finished lying back of them in course of construction?

Mr. RYAN. That is exactly true.

Senator REED. Now, what was the experience when you came to try these planes out, these so-called Bristol fighters?

Mr. RYAN. The first experience with the Bristol that I have definite knowledge of was almost immediately upon my assuming my duties. Two of them, I think, were sent to Dayton. They were sent to McCook Field, I think. One of them, in a flight, developed a weakness in the fabric which resulted in an accident. The plane got out of control of the operator and dropped into a nest of telegraph wires and it was broken up, but the flyer and observer were not seriously hurt.

Senator NEW. Was that the accident in which Doolittle was pilot?

Mr. RYAN. I do not recall the name.

Senator FRELINGHUYSEN. Did you see the accident?

Mr. RYAN. No.

Then the department or our engineers and the Curtiss people at Buffalo went to work to reinforce the wings of two more, and paid particular attention to putting on the fabric, fastening it, and they thought that they had overcome the defects. These two planes had flown at the time at Curtiss Field in Buffalo. One of them had been flown, say, four or five times, to a total, I think, of 2 hours and 56 minutes in the air. About the 12th of June, when I was at Buffalo with Mr. Potter, Mr. Landon, and others who were on an inspection tour with me, this plane that had already been flown something over two hours in the air was taken up by a man named Rader, with an observer by the name of Connors. Before they went up we talked with them. We looked over the machine and got their comments upon it. They were enthusiastic about it.

The flyers and the people who were connected with the thing were quite enthusiastic about it, and felt that they had found the trouble and corrected it. The machine was taken up into the air, perhaps 2,000 feet. The flyer did several very sharp stunts, one known as the Immelman turn, which is a very quick, sharp movement in the air, and very hard on the plane. Almost immediately after performing this stunt, we noticed that he was volplaning and coming down, and some of the men standing in the group on the field wondered why he

was coming down so soon. Just about that time—it all happened so quickly that it is almost impossible to say how it did happen—we all noticed the fabric on the upper wing was flapping and loose and just as some one mentioned that—we all saw it at the same time—the machine turned nose down and shot down to the earth and buried itself almost the length of the engine. Flames burst from the gasoline tank and shot up into the air 25 or 30 feet. Of course, the men were killed instantly. The machine was destroyed right there in front of our eyes and in less than 100 yards from where we were standing, as a result of that accident.

Senator REED. That turn that was made with this machine was one of the maneuvers that flyers are required to make and that a good machine ought to perform?

Mr. RYAN. Yes, sir; and that machine, if it was the kind of machine that we were trying to build, should perform that maneuver. It was not anything unusual for that type of machine.

Immediately after that accident took place—we stayed there to get the men out and all that—we held a short conference, and I gave orders that the other machine of that type that had been completed and was there on the field ready to fly should not be flown, and that machine, or any of its type, should not be flown until they were sure everything was correct, or that its defects were corrected.

Two other machines, I think, were then reconstructed by putting in additional ribs and strengthening the wings. The general consensus of opinion among the experts was that it was the vibration in the wings that caused the fabric to give way. The wings were strengthened by putting in additional ribs. A new and coarser and heavier fabric was obtained, and two of these machines were built, and one of them was flown every day, I think, for a week. The reports on the flights of that machine were again quite enthusiastic. It gave a splendid performance. They were all quite sure that the defects had been remedied. Mr. Landon had been up there and seen these flights. He came back and told me they thought that there was no doubt but what they had the Bristol fixed at last. They felt very well satisfied with the performance, believing that it was quite satisfactory and there was no indication that these machines were defective. He attributed it largely to the strengthening of the wings and the use of stronger and coarser fabric. Then it was decided that we should go on and make a few of the wings with that fabric. There was a delay waiting for the manufacture of the fabric because there was none to be had. There was only a small quantity to be had in the first place. While we were waiting for the fabric the machine was flown again—I do not know just how many times—but at last, on one flight, practically the same thing happened to it.

Senator REED. The same as what?

Mr. RYAN. As happened to the one I saw on the field. The fabric came off, and the plane came down and killed the pilot and the observer.

At that time I was in Washington. Of course, I did not see that. I called a conference of all the men who had anything to do with that, including the technical section in Gen. Kenly's department. There was a conference between Gen. Kenly's technical men, Mr. Landon, Col. Mixter, Mr. Potter, and all of our men, and they decided and reported to me that, in their opinion, it was unsafe to go

on manufacturing that machine, with which opinion I was entirely in accord. I had my own opinion formed before the result of their conference was known to me, and it was that I would not allow another one of those machines to be flown or be finished, and it did not make any difference what their conference reported. That was my own frame of mind about that, so that I was very much pleased when they decided that it was an unsafe machine to build and fly, and that we had better abandon production, which we did.

Senator REED. What were the reasons upon which the board of experts condemned the machines?

Mr. RYAN. The reasons were that it appeared to be impossible to build a machine of that type that would be so free from vibrations with a motor as powerful as the Liberty motor as to render it a safe machine for effective military use.

Senator REED. Now, there had been a Bristol machine in England of which this Bristol was an adaptation?

Mr. RYAN. There had been.

Senator REED. The Bristol in England had performed well.

Mr. RYAN. Yes; with the 225 horsepower motor, and the attempt to adapt the Bristol plane, as used in England, to an engine of 400 horsepower, caused the trouble.

Senator REED. The much greater weight.

Mr. RYAN. Its added weight. There was such vibration in flying it that it was absolutely unsafe—as was proved by those two accidents.

Senator REED. In a word, this engine's power and weight combined, tore that machine to pieces?

Mr. RYAN. There is no doubt about that.

Senator REED. Therefore, you concluded that the Liberty motor could not be used in that type of machine?

Mr. RYAN. Exactly.

Senator REED. It would have to be used in a more powerful and sturdier machine?

Mr. RYAN. Exactly.

Senator REED. So that the Bristol fighter has been put into the discard?

Mr. RYAN. The adaptation of the Bristol fighter to use the Liberty motor has gone into the discard permanently, so far as I am concerned.

The CHAIRMAN. Do you mean the Liberty motor or the Liberty 12?

Mr. RYAN. I mean the Liberty 12.

Senator REED. How much money has the Government expended on them?

Mr. RYAN. I have not got the figures on that. I have asked for it. I asked some time ago for them accurately for our own satisfaction. There is some dispute about what the expenditures were, and what they were properly chargeable against.

Senator NEW. It was a question of salvage?

Mr. RYAN. Not only that but a question of charges of the manufacturer not being properly chargeable.

Senator FRELINGHUYSEN. It was stated in the evidence that it was about six and a half million. Do you believe it is more or less than that?

Mr. RYAN. I believe it is less. I do not think it can possibly reach those figures.

The CHAIRMAN. Those figures were furnished either by Maj. Smith or Brown.

Mr. RYAN. I do not think the figures will reach that amount.

Senator NEW. I would like to ask one question right there. Is it not true that after all the most serious feature of the loss is not the loss of the money but the loss of time in the Curtiss factory which was put on the manufacture of machines that proved so unsatisfactory as to have to be abandoned?

Mr. RYAN. Unquestionably. The loss of money, as I regard it, is not of any importance as compared with the loss of time, or, for that matter, the loss of life.

Senator FRELINGHUYSEN. How many men lost their lives?

Mr. RYAN. Four.

Senator REED. If we are going to discuss that point, how many men are going to lose their lives or have already lost their lives on the battle front, that might have been saved if we had a thousand planes over there? However, that is water over the dam.

Mr. RYAN. Just in passing, so that you will understand how they felt, these engineers that had constructed this plane and had seen it flown for about three hours in the air, walked around and talked about it that day. They felt so sure that they proposed to take me in the plane and fly to Dayton with it. They proposed to fly to Dayton in that plane that came down within 20 minutes afterwards.

Senator REED. What is being done now with reference to an attempt to procure an engine that can be employed in this plane so that the work may possibly be saved?

Mr. RYAN. I do not know how much work will actually be changed, because this plane is not at all the original Bristol plane. We now have two British Bristol planes of the regulation Bristol type, one in this country and the other about to arrive. One is a complete Bristol plane with the English engine in it. We are to put the U. S. Hispano Suiza engine into the two other British planes.

Senator REED. Of what power?

Mr. RYAN. Three hundred horsepower into these strictly British planes to test them, and we are about to send them out to the Wilbur Wright field for tests.

Senator REED. There will not be anything much to test about that, because the English have used the Hispano-Suiza motor.

Mr. RYAN. Not in this particular plane. They have used the same power in the plane.

Senator REED. They have not used it in this plane?

Mr. RYAN. Maybe they have. I may not be correct about that.

Senator REED. So that you do not hope, then, to find an engine that will fit this plane as it is now built in this country, but you do hope that you are going to produce a fighter by copying an English Bristol and by putting in this Hispano-Suiza engine?

Mr. RYAN. That is true.

Senator REED. Are you also going to try the 8-cylinder Liberty motor?

Mr. RYAN. Yes, sir.

Senator REED. You are having some made now?

Mr. RYAN. We have ordered the Liberty 8. They will be in production later on.

Senator REED. The original plan, just to put the history in here, with reference to the Liberty motor, was that it should be made in 6 cylinders, 8 cylinders, and 12 cylinders. That was afterwards abandoned for the 12-cylinder motor, so that they never got into production on the smaller types.

Mr. RYAN. They canceled production on the 6's and 8's?

Senator REED. Just in order to settle the question we discussed a moment ago, here [indicating photograph] is a Bristol fighter, the F2B. One is shown with the 190 horsepower Rolls-Royce-Falcon. There is another Bristol fighter with a 200-horsepower Hispano-Suiza engine, so that I take it, this being a copy of an official table, they must have been using the Hispano-Suiza in England.

Mr. RYAN. Yes; they did use it.

Senator REED. As a matter of fact, if we had been content at the time that we first started into airplane work and after we entered the war to take the Bristol fighter and employ the facilities of this Government and its factories already existing for the manufacture of the Hispano-Suiza engine for that plane, we could have had a large number of these planes by this time, could we not?

Mr. RYAN. The 200-horsepower Hispano-Suiza engine has only just reached production.

The CHAIRMAN. The 300 horsepower?

Mr. RYAN. The 300 horsepower has just started.

Senator FRELINGHUYSEN. You mean the 180?

Mr. RYAN. The 180; yes. It is really a 200-horsepower motor. Here is a picture [indicating] of the Bristol fighter F2B, with the Rolls Royce 190-horsepower motor. That is given as one of the typical planes now in use.

Senator REED. Don't you find the Hispano-Suiza in there, too?

Mr. RYAN. No, sir; it is not.

Senator REED. It is undoubtedly used.

Mr. RYAN. Yes.

Senator REED. Do I understand that the Hispano-Suiza is a motor that we have been capable of producing in considerable quantities?

Mr. RYAN. The 180-horsepower Hispano-Suiza is a modification of the 150. We have been producing 150-horsepower Hispano-Suiza engines in quantities. By making it a high-pressure engine they made it 180 horsepower. The 200 horsepower is now practically the high-pressure type of the 150 engine, and it is now just in production. It is just commencing to come in.

Senator REED. If we had started on them when we started into the aircraft business at the time we appropriated \$640,000,000, they could have been in production long ago?

Mr. RYAN. I think, Senator, changing that engine from 150 to 180 horsepower was the result of French development. The application of high pressure to the engine has only recently taken place. I think as soon as the French accomplished that and demonstrated it, the drawings were sent over here and the work of changing production in this country from 150 to 180 was undertaken immediately; and it is only just now resulting in production.

Senator REED. This is true, anyway, is it not, that we were capable of quantity production of the 150-horsepower Hispano-Suiza, is that right?

Mr. RYAN. Yes, sir.

Senator REED. It is also true that that engine works admirably in the Spad machine, which was an up-to-date fighting machine?

Mr. RYAN. I think so.

Senator REED. It is a machine that is still used by the French and is regarded as one of the best machines?

Mr. RYAN. That is true.

Senator REED. If we had started on that type of machine, where we could have the plane and copied where we could have the engine, we would have a fighting machine now?

Mr. RYAN. I think so.

Senator REED. As a matter of fact, we have not a single American-made fighting machine on the front.

Mr. RYAN. Do you know why the Spad production was stopped?

Senator REED. I say, as a matter of fact, we have not a single American-made fighting machine to-day on the front?

Mr. RYAN. I think that is true.

Senator REED. As a matter of fact, we have not a single American-made fighting machine anywhere, have we?

Mr. RYAN. I think that is true; that is, that is finally accepted.

Senator REED. You are experimenting now with some other machines; what are they?

Mr. RYAN. We are building the S. E. 5.

Senator REED. And the S. E. 5 is, after all, a very close copy of the Spad?

Mr. RYAN. I think you would call it an interchangeable machine. The French prefer one and the British prefer another.

Senator REED. There was a contract before you were connected with the board for 2,000 of these Spad machines. That contract was made with the Curtiss Co.?

Mr. RYAN. Yes, sir.

Senator REED. The contract, after the work had progressed to some considerable extent, was canceled?

Mr. RYAN. Yes.

Senator REED. And now the Government is making a machine which you say is practically interchangeable with the S. E. 5?

Mr. RYAN. I would say that it is interchangeable as far as use is concerned. The British prefer one and the French prefer the other.

Senator REED. It is not supposed by the experts to be very much better?

Mr. RYAN. One nation prefers one.

Senator REED. And the other nation prefers the other?

Mr. RYAN. Yes, sir.

Senator REED. We had the Spad machine practically in quantity production and we had contracts made and work laid out for 3,200 which were ordered from one factory. Months afterwards we start in the production of another fighter, which is practically an interchangeable machine, in the sense that it performs the same duties as the Spad; is that the situation?

Mr. RYAN. Yes, sir; that is the situation.

Senator REED. Why was it that the work on the Spad machine was stopped?

Mr. RYAN. It was stopped by Gen. Pershing.

Senator REED. Have you that order? I have never seen that order.

Mr. RYAN. That order came in November. My connection dates from May 20. You would not expect me to go back and criticize or make any comment upon anything that happened that far back?

The CHAIRMAN. We have that telegram. The Spad order was canceled in October. Gen. Pershing's telegram upon the subject bears date of December 14, two months later.

Senator REED. And, as I understand it, it is not an absolute rejection?

The CHAIRMAN. No.

Mr. RYAN. My recollection was it was November, but, as I say, it was a thing before my time. I have not been delving into past history. I have had too much ahead of me. I have taken it for granted that the cancellation came from Gen. Pershing.

The CHAIRMAN. We were told so. Finally Col. Arnold told us he had never had a telegram. It was sent, together with others, as one telegram upon the subject. It bears date two months after the cancellation of the contract.

Senator FRELINGHUSEN. Why did you decide upon the S. E. 5?

Mr. RYAN. It is a serviceable machine. It has a long service and splendid record.

Senator FRELINGHUYSEN. Isn't the Spad a faster and better machine?

Mr. RYAN. That is a matter of opinion, Senator. The English will tell you that the S. E. 5 is a much more reliable machine, while the French, on the other hand, will tell you that it is the other way about. There you are. If you were to sit down and listen to these people, you will find that they will convince you against your will.

Senator REED. Where are you going to get an engine to put into the S. E. 5?

Mr. RYAN. The 180 Hispano-Suiza or the Liberty 8 motor.

Senator REED. The 180 Hispano-Suiza you could have gotten in the form of the 150 a year ago?

Mr. RYAN. That has not power enough.

Senator REED. That 30 horsepower makes a difference?

Mr. RYAN. The 180 really makes a 200-horsepower engine. You see, the French rating of horsepower is different from ours.

Senator REED. The English and French were both using an engine of 150 or less.

Mr. RYAN. They were a year ago, but they have gone to a higher power.

Senator REED. But I am speaking about having ability and chance to get something, and we did not get it.

Mr. RYAN. No.

Senator REED. We fooled away our time and tried to build a machine that would fit the 12-cylinder Liberty motor. That is what we did, is it not?

Mr. RYAN. I think we did, so far as the fighter is concerned.

Senator REED. We have had experience also with the DH 4?

Mr. RYAN. Yes, sir.

Senator REED. What was the condition of that as to its production when you took charge?

Mr. RYAN. The production had just started.

Senator REED. The DH 4 was planned for what?

Mr. RYAN. For the Liberty motor.

Senator REED. But for what service?

Mr. RYAN. For observation or day bombing.

Senator REED. To use for photographic work, also?

Mr. RYAN. It would be an observation machine. If you did not carry bombs, you could carry cameras.

Senator REED. Was it ever planned to be both a bomber and observation machine?

Mr. RYAN. Oh, yes.

Senator REED. To carry a camera and bombs?

Mr. RYAN. Not altogether. It is not likely that they would carry them together. They would load one or the other going out.

Senator REED. You say that that machine is just coming into production?

Mr. RYAN. Just.

Senator REED. What about the contracts?

Mr. RYAN. I think we had 4,000 on order with the Dayton Wright people. We had quite a fair sized contract with the Fisher Body Corporation.

Senator REED. How many, do you remember?

Mr. RYAN. One thousand, and five hundred with the Standard Aircraft people.

Senator REED. That would make 6,500?

Mr. RYAN. We had that or more.

Senator REED. How much money has the Government expended or committed itself to expend so that it will have to be paid on these machines?

Mr. RYAN. That is a thing that can not be stated definitely, because they are under a cost-plus contract. We do not know what the cost is going to be.

Senator REED. By the way, the Bristol Fighter was under a cost-plus contract, was it not?

Mr. RYAN. Yes, sir.

Senator REED. I am not asking you to tell with absolute accuracy, but give me your best estimate as to the amount of money the Government has become committed to pay on account of the DH 4.

Mr. RYAN. I could not determine that accurately. We have never been able to determine accurately.

Senator REED. It will run into some millions, will it not?

Mr. RYAN. Undoubtedly.

Senator REED. The fact of the matter is that the manufacture of the material had progressed to a very large degree?

Mr. RYAN. Oh, yes, sir.

Senator REED. Do you know what the contracts called for?

Mr. RYAN. They were cost-plus contracts, as I say. I do not know what they will run.

Senator FRELINGHUYSEN. About \$5,000 or \$6,000?

Senator REED. Is there any way in which we can estimate that? What did you find out about the De Haviland plane as a flyer?

Mr. RYAN. Should you mind if I should tell this story as it comes to me regarding the De Haviland plane?

Senator REED. No. All I want is the facts. If you give them to me in your own way, that will be quite satisfactory.

Mr. RYAN. When I took hold of this business, the De Haviland plane was in production at Dayton. The contracts had also been let to the Fisher Body Corporation and the Standard Aircraft Co. I visited all those plants in June. The Fisher Body Corporation was just commencing to make parts. They had not turned out the finished plane. The Dayton people were producing. I think they made an effort to make a record production about that time, because your committee was going there and I was going there. I think they reached a production of 16 planes the day before I was there. The first thing that we asked for—and this was one of the first acts of my administration—was that the first 100 De Haviland planes should be left in this country to be sent to all the flying fields and practically flown to destruction to determine any mechanical defects, any defects in design, or any faults that could be found in the planes. Our proposal to keep 100 planes here and to find out what was wrong with them—and we were sure there would be things wrong, as there would be with anything of the kind that was manufactured practically new in a new country with new labor and new conditions and new materials—was refused because Gen. Pershing thought he ought to have the planes just as soon as they could be sent to him.

Senator REED. When did he make that known?

Mr. RYAN. I do not know, sir.

Senator REED. In what way did he make it known?

Mr. RYAN. Through the chief of staff.

Senator REED. Is there any telegram or letter from Gen. Pershing to that effect?

Mr. RYAN. I think there is. I think I can find it for you.

Senator REED. Upon what information did he act when he demanded these planes?

Mr. RYAN. Upon the need for them, I suppose.

Senator REED. Did he know that the plane was experimental?

Mr. RYAN. No.

Senator REED. Did he know the workmanship was imperfect?

Mr. RYAN. I do not know. We did not know.

Senator REED. Could you get these documents?

Mr. RYAN. I think I could. I do not know that I could. I only know that in a general conference, in talking the thing over, we were told that we must send them over as fast as we could produce them. That information does not come to me. That comes to Gen. Kenly. I take orders from him. I have to turn the planes over to him at the door of the factory.

Senator REED. Let us discuss this a moment.

Mr. RYAN. May I continue? I would like to go on.

Senator REED. Yes.

Mr. RYAN. When we learned that we were not to be allowed to keep these planes here and try them out and find out if there were any defects, as we were sure there would be, we decided to send a man—Lieut. Farwell—to France, to be there when the first ones arrived. He went to France. He went to the chief of the air service

of the American expeditionary forces and asked for some one to be assigned to look after these machines. We were going to try to find out everything there was to be found out about them as soon as possible. He explained that we had none in this country from which to get that information. Col. Dodd, of the American expeditionary forces, was assigned to that duty with Lieut. Farwell. I am not sure he was a colonel, but his name was Dodd, anyhow. Lieut. Farwell and Dodd then conducted all of the flights and reported on them, made examinations of the machines, and got all of the information upon which Gen. Pershing's long cable, giving the list of defects in construction and everything of that kind, was based.

Now, it has been generally supposed that Gen. Pershing's cable was the result of their finding out all these things over there without anybody on this side being concerned at all, and that we did not know anything about this. As a matter of fact, Lieut. Farwell, who was sent for that very purpose, came back and reported on the 13th day of June, giving all these defects and setting forth all those troubles, and stating practically, line for line and word for word, everything that was set down in Gen. Pershing's cable that was dated the 24th of June, 10 days after a report was made by our own man.

Senator REED. That does not make any change as to the condition of the machine.

Mr. RYAN. It does change it to this extent, and I want that made clear for the sake of my predecessors. Mind you, that is a thing that I could not have had anything to do with, because my connection was so recent. Whether it was bad or whether it was good design, or whether it was faulty in construction, it could not affect me one way or the other, but the knowledge that machines made under the conditions that these machines were made under were likely to develop defects, and all that, was in the minds of these people here. That was thought of over here. This man was sent over for that purpose, to look out for those things, and he found them. He was employed by the production department and sent over by the production department, and to my mind it is as important to realize that as it is to——

Senator REED. Very well. The De Haviland 4 was an English machine that had been adapted to the 12-cylinder Liberty motor?

Mr. RYAN. Yes, sir.

Senator REED. It never had been tried out when the 100 planes had been sent?

Mr. RYAN. That is virtually correct.

Senator REED. It had never been tried out. Therefore, of course, until 6,000 or 6,500 planes had been ordered and put into production——

Senator FRELINGHUYSEN. That is, 8,500.

Senator NEW. Eight thousand five hundred is what the contract called for.

Senator FRELINGHUYSEN. Four thousand for the Fisher Body Corporation and 4,000 for the Dayton-Wright people and 500 for the Aircraft Co.

Senator REED. Of course, if it had never been tried out before it was sent to France it was never tried out before the 8,500 were put into production?

Mr. RYAN. I think the individual machines had been tried out, but the production machines had not been.

Senator REED. The machine had not been tried out to a point where you regarded the machine as safe to send, or your predecessors regarded it as safe to send, so that you sent a man along to see what the defects were?

Mr. RYAN. I do not think I would allow any batch of production machines, no matter how many individual machines had been tried out, to be sent out for service, if I could avoid it, without giving them a trial. The production machine is entirely a different thing from the individual machine, made more or less by hand and made more or less under close supervision, while production, on the other hand, goes along at the rate of from 5 to 10 and 20 a day. The two machines are entirely different. Those machines should be tried out and must always be tried out after production has been reached.

Senator REED. You have discontinued the manufacture of the De Haviland 4?

Mr. RYAN. No.

Senator REED. What have you done? There has been an order that there shall not be a De Haviland 4 made until certain changes, being principally those mentioned in the cablegram of Gen. Pershing, are adopted.

Mr. RYAN. Incorporated.

Senator REED. Incorporated; yes.

Mr. RYAN. Those changes will take probably a week, but there has been no cancellation of the De Haviland 4. There has been only an order to this effect, that these changes shall be incorporated.

Senator REED. Do you intend to go on making the De Haviland 4 after making these changes?

Mr. RYAN. Unquestionably.

Senator REED. What do you expect to use it for?

Mr. RYAN. For observation and day bombing.

Senator REED. How do you know that these defects that attention has been called to can be remedied?

Mr. RYAN. Well, I have the opinion of the engineers.

Mr. REED. The same engineers who had the opinion were the engineers who produced the machine?

Mr. RYAN. No; not entirely. These changes had been agreed upon by the engineers of the technical section of the Department of Military Aeronautics and of the Bureau of Aircraft Production as being practicable and desirable to make.

Senator REED. These same gentlemen are the men who approved changes in the Bristol Fighter and thought it was perfect?

Mr. RYAN. I think not. I do not remember that any of them were. I think it is practically a new set of engineers.

Senator REED. Do you think they are better ones?

Mr. RYAN. I would not want to express an opinion as to my own selections.

Senator REED. Putting this thing in plain language, you are going back to making these changes in the Bristol Fighter. It has never been tested or given a thorough test with the changes made. You hope it will fly; I mean fly with a reasonable degree of safety, but you do not know; that is the situation, is it not?

Mr. RYAN. No, Senator.

Senator FRELINGHUYSEN. Senator Reed, did you mean to say the Bristol Fighter?

Senator REED. No; I mean the De Haviland.

Mr. RYAN. We are going to make the changes that have been agreed upon by the engineers, including those that have been recommended by the men who have observed the flying on the other side and the men who have flown them on this side, and we feel that with those changes made the De Haviland is serviceable, useful, and of military value.

Senator REED. Do you think it is a good machine?

Mr. RYAN. A very good machine for certain purposes.

Senator REED. You agree, do you not, that it is not a fighting machine?

Mr. RYAN. It is not a so-called fighter; it would not come under that term "fighter."

Senator REED. You agree, do you not, that the pilot and the so-called observer are so far apart that it is very difficult for them to communicate with each other?

Mr. RYAN. It is.

Senator REED. You agree, do you not, that the line of observation is very much obscured? In other words, the machine is so built that the line of observation by the pilot is very much obscured?

Mr. RYAN. We are aiming to correct those things in what is known as the De Haviland 9, which we are aiming to put into production as soon as we can without materially reducing the production of the De Haviland 4.

Senator REED. I am speaking of the 4.

Mr. RYAN. Those are other improvements, but they do not prove that the 4 is not a good machine.

Senator REED. You agree, do you not, that as a bomber it is subject to a very great criticism because the point of observation downward is so circumscribed that the operator can not properly sight when he undertakes to drop a bomb?

Mr. RYAN. Well, I do not think it is as good, or that he has as clear observation, as he will have in the 9, which we are building. But the 4 is practically a copy of the British machine, and that has been and is a very useful machine.

Senator REED. But you have put a Liberty motor in it, have you not?

Mr. RYAN. We have put a Liberty motor in it, which does not affect observation. It does not affect any of the features which you have spoken of.

Senator NEW. But you have added several hundred pounds of weight to the machine; that is, comparing the American-built with the English-built De Haviland 4, the American plane weighs several hundred pounds more than the English plane.

Mr. RYAN. The plane weighs a little more, not very much more. But the amount of water and gasoline necessary to be carried for the Liberty motor is in excess of the amount carried by the Rolls-Royce motor, which is used in the English plane.

Senator NEW. The weight of the English plane, as I recall it, is 1,630 kilograms, and that of the American plane is 3,423 pounds.

The CHAIRMAN. And a kilogram is 2.1 pounds.

Mr. RYAN. The De Haviland 4 is a faster machine, of splendid climbing power, but of short radius; that is, short endurance. As a machine for a quick trip, for observation, or for bombing, or for machine gunnery it is a very effective machine. It is a quick-acting machine; perhaps the most effective of any of its type. It has not a large radius of action. It can not be gone from base but an hour and 50 minutes, but during the time it is up it is a very effective machine, and its performance in speed and climbing excels the British machine of the same type materially.

Senator REED. Now, Mr. Ryan, you agree, do you not, that some of the trouble reported by Gen. Pershing, and perhaps reported by some of these other men, was bad workmanship?

Mr. RYAN. Entirely. There is no doubt about that.

Senator REED. You agree, do you not, that no living man can successfully sight a gun and at the same time steer a machine when the gun is off to his left so that he has to throw his body over out of line with the flight of his machine?

Mr. RYAN. I have never heard any serious complaint as to the ability of the gunner to handle the gun in the De Haviland plane.

Senator REED. Do you know that the best and most experienced flyers, a number of them in this country, have testified before this committee that they regard the De Haviland machine as utterly unsafe, and that they would refuse to go up in it or send subordinates up in it?

Mr. RYAN. I understand that some have testified that they have refused to go up in it or let subordinates go up in it, but then these officers in charge of a field, where within a short time—when I was on the field, D. H. 4's were in the air. They were being flown.

Senator REED. You do not understand my question. No officer in charge of a field, as I recall it, has testified in that way.

The CHAIRMAN. Yes; Reinhardt did.

Mr. RYAN. I heard in a roundabout way that an officer had testified that he would not fly and would not let anybody else fly in a De Haviland 4. I was on Reinhardt's field the other day when there were three of these machines flying. I talked with the flyers and spent several hours going over the D. H. 4's right there.

Senator FRELINGHUYSEN. Was he in charge of the Hazelhurst field?

Mr. RYAN. Yes, sir. In charge of the flyers—

Senator REED. If the machine is all you say it is, why is it you are making a different type of machine?

Mr. RYAN. We are finding methods of improving. It is a desirable thing to bring the pilot and the observer together. It is a desirable thing to build a machine for better observation, for dropping bombs, and those things. We will constantly improve these machines, but we will not discard the ones we are building meanwhile.

Senator NEW. Then it is the purpose to supplant the De Haviland 4 with the De Haviland 9, or the American equivalent?

Mr. RYAN. U. S. 9.

The CHAIRMAN. Or the U. S. 9-A.

Mr. RYAN. And the U. S. 9-A. They are machines used for different purposes.

Senator NEW. It is the intention to supplant one of these machines as speedily as it can be done?

Mr. RYAN. Without affecting the production of the De Haviland 4.

Senator REED. You propose to go on making the De Haviland 4 machine?

Mr. RYAN. Until we can put the De Haviland 9 into production.

Senator REED. Do you intend to do that regardless of any testimony that may be given by experienced flyers that the machine is utterly unsafe?

Mr. RYAN. I am not convinced that the burden of testimony of the flyers throughout the country that are flying the De Haviland 4's, is to the effect that it is an unsafe machine. I do not think it is. There are individual flyers who will express such an opinion, and there are others who speak in the highest terms of the De Haviland 4.

Senator FRELINGHUYSEN. Outside of what may appear in the testimony—and I have read a great part of the testimony, including that of Maj. Muhlenberg and some others from the testing department at the Wilbur Wright Field—there was one officer from Hazelhurst, who said the machine was structurally weak and extremely dangerous. Then there was an officer, Capt. Kelly, I think, and one or two other flyers, who gave some testimony. They said that the machine was extremely dangerous. The points that were made were that it was structurally weak in some of its connections with the fuselage; and the thing that I can not understand is why won't the same thing happen, when using this high-powered Liberty motor, that has happened with the Bristol fighter?

Mr. RYAN. It will not happen because the De Haviland has been flown a total of hundreds of hours, and they have never killed a man that I know of.

Senator NEW. They killed Patterson.

Mr. RYAN. Yes; but he was doing a nose dive. It is not a machine that that thing can be done with. Every flyer that I have heard has said that the stunt that Patterson did with the De Haviland 4 was something that no one who had a proper conception of what the machine was able to do would attempt.

Senator NEW. It has been testified to here that Lieut. Patterson was sent up under orders to obtain a ceiling of 15,000 feet, and then to plunge downward in order to test out his guns in vertical fire, and that it was in the execution of that order that the linen came off the wings, and then it was followed by the wings leaving the fuselage.

Senator FRELINGHUYSEN. In Gen. Pershing's cablegram, one of the criticisms was to the effect that the Liberty motor was defective, that the Lincoln was better than the Packard. That would seem to indicate that more than one Liberty motor was defective. Now, is the Liberty motor defective?

Mr. RYAN. I would not consider it so. I think, Senator, every motor in the world, and particularly every aeronautical motor, is defective in degree. There is no such thing as a 100 per cent efficiency, and there will never be. The question is whether the product of one company is more defective than that of another. It may be a question

of workmanship. That is corrected from one day to another or one hour to another in a given shop. It may be a certain batch of Lincoln motors might be better than a certain batch of Packard motors. It might be the other way about. These things are changed all the time. To say that it is a defective motor, I think is a mistake, because the purpose for which the Liberty motor is designed, from my observation—and I have talked with manufacturers, with flyers, with plane manufacturers, and everybody else—makes it the best motor on either side. There is no motor on either side that compares with it. That is my opinion after what I have heard. I have no reason to be prejudiced in favor of or against the Liberty motor, because I have had nothing to do with its design or manufacture. I had nothing to do with it up to the time it was in production. Without a doubt, in my opinion, for heavy work and for fast work in heavy planes, there is no motor on either side that compares with it.

Senator FRELINGHUYSEN. Do you recall that criticism in that cablegram?

Mr. RYAN. Yes, sir.

Senator FRELINGHUYSEN. Do you know what caused it?

Mr. RYAN. No. I think it would come about more as an individual opinion, and probably would not be, and I think has not been, admitted or borne out. I mean, admitted by our engineers in this country or by the British engineers, or both. Certainly they are as well qualified as anybody can be to pass on the merits of the motor.

You understand, of course, that I do not want to appear in the record as making a stump speech, but as far as the Liberty motor is concerned, perhaps as thorough a trial of the Liberty motor as has ever been made, has been made in England, and they are unqualified in their statements that it is the best motor of high power that has been produced. There are certain improvements that they make, principally with the carburetor, but they distinctly cabled us not to make any changes, to make them as we were making them and send them over, as their changes were slight and they could make them. Immediately when we got that telegram we sent the engineers to England to learn all they could find out about these carburetors.

Senator NEW. Is it not also true that they gear the motor over there to use in their heavy planes?

Mr. RYAN. Yes, sir; and we are starting to gear it.

Senator NEW. To make it a geared motor?

Mr. RYAN. To use a geared motor. We use a geared motor in one and a direct drive in another. We are starting to make both. They want some geared motors for the Navy.

Senator NEW. It is necessary to reduce the speed of the propeller in the heavy plane?

Mr. RYAN. Yes, sir.

Senator FRELINGHUYSEN. As I understand it, the equipment division of the Aircraft Production Board was in charge of three officers, Col. Deeds, Col. Montgomery, and Col. Walden, who, from the evidence and various experiences that I have had, practically controlled the policy of production prior to your directorship. Now, have those men, or any of them, at the present time, anything to do with your department?

Mr. RYAN. Not so far as I know.

Senator FRELINGHUYSEN. Do you intend to allow them to have any influence in your department in aeronautics?

Mr. RYAN. I do not think it would be fair to ask me to answer that question in the light of the investigation that those men are under by the Department of Justice. I do not think I ought to say what I think. I do not think I ought to prejudice their cases that are under investigation by any statement as to what I intend to do, without having the result of the investigation made by order of the President placed before me. I do not want to do that.

Senator FRELINGHUYSEN. Under those circumstances I will not urge you to answer the question, but I attribute so much of the breakdown to either poor judgment or something else in this aircraft program that I feel that those men should not have any interest or say in aircraft matters hereafter.

Mr. RYAN. The only thing I can say, Senator, about that is that since this investigation by the Department of Justice was commenced and the order of suspension was issued affecting those three officers, so far as they have taken any part in discussions, their advice has not been asked or received, and they have had no official connection with the Bureau of Aircraft Production.

Senator FRELINGHUYSEN. Is Col. Vincent still with your department? Has he a position in your department?

Mr. RYAN. Yes, sir. Col. Vincent is the engineer in charge of the McCook field.

Senator FRELINGHUYSEN. Is he at the present time?

Mr. RYAN. Yes, sir; he is under Mr. Nash.

Senator FRELINGHUYSEN. In what capacity?

Mr. RYAN. McCook field is largely a testing field, as you know. It is almost entirely a testing field.

Senator FRELINGHUYSEN. Do you believe it is good policy to have a man who has been connected in an official and technical capacity with a company that has large contracts with the Government in such a responsible position?

Mr. RYAN. I will answer that by saying that I believe that the man who has the greatest knowledge and the greatest ability in a particular engine's construction is invaluable regardless of what his connections have been. He has nothing to do with making contracts; he has nothing to do with anything relating to the money end of this business; that is entirely out of his hands. Considering his technical knowledge, if he has more experience and more knowledge of a particular type of engine that we are committed to in our whole air program than any other man, I would consider it a great mistake to dispense with his services.

Senator FRELINGHUYSEN. Do you not think it would be as well to have a man who was familiar with aero dynamics who was not connected with any manufacturing interest doing business with the Government?

Mr. RYAN. Of course. We have many of them and Col. Vincent has not been a superior officer. He has always been subject to a higher authority. Now he is under the control of Mr. Nash.

Senator FRELINGHUYSEN. Has he not had a great deal to do with the testing of the De Haviland 4 in flying?

Mr. RYAN. Undoubtedly.

Senator FRELINGHUYSEN. Those tests have been reported heretofore—I do not know whether to your department or to the equipment division—as satisfactory, have they not?

Mr. RYAN. I think generally so; yes, sir.

Senator FRELINGHUYSEN. In view of the rather discouraging reports of Lieut. Farwell, do you think that Col. Vincent is capable, having passed the De Haviland 4 in his tests?

Mr. RYAN. I do not know that Col. Vincent has ever absolutely approved the De Haviland 4 in its entirety. There have been constant changes made and there always will be. Things will be corrected from one week to another. We will have another batch of changes in this plane or another. They never stand still. The question of these changes rests very largely upon the individual judgment of engineers. They disagree about these things. In those changes we are making our engineers are not in accord. They are necessary according to a preponderance of opinion, but changes are constantly occurring, varying with individual opinion.

Senator FRELINGHUYSEN. I understand the final decision in regard to those tests, engineering tests, rests at the present time with Mr. Nash and Col. Vincent?

Mr. RYAN. No; rests at the present time with Mr. Nash and Mr. Landon, and also with Col. Vincent and Col. Bane, of the department of military aeronautics. I might add also with Maj. Jones and others. It is a combined board of the department of military aeronautics and the Bureau of Aircraft Production. As far as the bureau is concerned, they are under the direction of Nash.

Senator FRELINGHUYSEN. Is Mr. Day, engineer of the Standard Aircraft Co., of Elizabeth, N. J., one of your board?

Mr. RYAN. He may be called in, but he is not a part of the board.

Senator FRELINGHUYSEN. And Mr. Crane, of the Wright-Martin Co.?

Mr. RYAN. He may be called, but he is not a member of the board.

Senator FRELINGHUYSEN. Then they would have no final say in the decision, because at the present time they are engineers whose companies have contracts with the Government?

Mr. RYAN. They call in these engineers that have connections with other companies because, in some cases, they are men who know most about these things, but they have no final decision in the matter.

Senator FRELINGHUYSEN. Have you any interest in the Wright-Martin Co.?

Mr. RYAN. I did not consent to the reorganization of the Wright-Martin Co., which I think took place several years ago, so that I sold my stock in the open market at the time of the reorganization. I have held no interest since that time and hold none now.

Senator FRELINGHUYSEN. Have you any interest in any other company which has contracts with the Government?

Mr. RYAN. Not any.

(Informal discussion followed, which the reporter was directed not to record.)

The CHAIRMAN. Having completed your trip out West, I wish you would tell the conditions and prospect with reference to the spruce situation.

Mr. RYAN. I took a three weeks' trip. I made it three weeks because of my realization that the whole air program, not only of this country, but of the allies, was absolutely dependent upon the spruce situation, and it had to come from that section. I have had some experience, as Senator Thomas knows, in the lumber business, because in my own business we have conducted a large lumbering operation, and I have had for about 20 years something to do with it. I felt, therefore, that I was fairly well qualified to pass upon the work they were doing and the probabilities of production and everything of that kind. I spent days and nights in the woods. I talked with hundreds of people, dozens of men who are operators out there, and I saw the operations.

One of the things that impressed me most was the fact that the spruce we are after was one of the most despised woods in the forest until the need for it for aeroplanes arose. Spruce and hemlock grow together. An operator going in there to carry on his operations would avoid this stuff that we have got to have now. All that had to be corrected. We had to build new lines of railways; we had to build new lines of logging railway; we had to organize a situation that, so far as labor was concerned, was about the worst in the United States. The whole country was literally held by the throat by the I. W. W., and there was no production going on. There had not been for six months in the Puget Sound district.

They organized up there what is known as the Loyal Legion of Loggers and Lumbermen. To-day there are in that organization 125,000 men, each one of whom has signed a pledge that he will work without cessation, to the end of the war; that he will put all questions in dispute in the hands of Col. Disque for adjustment. Every operator in the district has consented to place in his hands the matter of pay, of hours, and conditions of labor and to abide by his decision. He has increased the efficiency out there very greatly. It has been increased beyond what it was before war times. They were getting, in the month of July, a production of first quality spruce and fir of 15,000,000 feet, and it will be 18,000,000 in August. We have to provide, at the end of four or five months, for the failure of production in the camps where the production is now coming from. That is because they are going to be exhausted. We have got to make provision for other large production to come in about that time, say, about the first of the year. There are about twenty-odd thousand soldiers under the command of Col. Disque, most of them on the railroads and in the forests, doing the hardest kind of work, and they are just as good soldiers as Pershing has in France, and just as anxious to go to France as any he has there. They are working willingly and with a spirit that I have never seen equalled before anywhere in the world. While I would not want to say that this spruce can be produced at a reasonable cost compared with ordinary times, considering the difficulty of selecting every tree, marking it by experts, cutting it down and transporting it, and then, when you put it on the carriage in the mill and find a spot or blemish in it, using it for the cheapest kind of cull, the present increased cost that is being realized is reasonable.

The CHAIRMAN. Of course, that must be subordinated to this great emergency.

Mr. RYAN. Entirely; and I so treated it.

The CHAIRMAN. Do you feel, from what you have seen, that we can rely upon the spruce production? Is there sufficient spruce for aeroplane purposes?

Mr. RYAN. I have not much doubt of it. I am convinced that we have that situation in hand; that it is being well handled; and that it is gradually being reduced to a reasonable cost basis.

They have built what they call a cut-up plant. They have built the biggest plant of its kind in the world out there. It has been increased since it was built. They cut 1,100,000 feet of lumber into small pieces, suitable for wing pieces and suitable for small stuff, in 24 hours. They built that mill in 45 days with soldier labor. That is a big job.

Senator FRELINGHUYSEN. Have you considered the Maine forests?

Mr. RYAN. Yes. We have turned over New England to the Navy. They are conducting operations in New England. We turn everything up in New England over to the Navy and everything in Canada to the British.

Senator FRELINGHUYSEN. I spent some few days in the Maine forests and I saw some very fine lumber. I am not an expert in lumber, but I considered it an excellent spruce forest that I saw.

Mr. RYAN. The Navy has charge of that. Of course, if a tree that is not absolutely clear, without a spot or blemish 100 feet from the ground, it is not fit for this work.

Senator FRELINGHUYSEN. I wrote you in regard to the observations we made in looking at the aeroplane factories with regard to fire. I consider that some of these factories are extremely dangerous. I have talked with Mr. Evans, and I think the committee feels that every effort should be made to see that the owners of the factories should protect them with every conceivable apparatus. I would not mention the factories by name.

Mr. RYAN. I think we are following it as far as we can. At least my directions are explicit to follow out the recommendations of the War Industries Board of the Council of National Defense in that respect.

The CHAIRMAN. If it is agreeable, we will adjourn now to meet again on Thursday.

(Whereupon, at 5.30 o'clock p. m., the committee adjourned until Thursday, August 15, 1918, at 10 o'clock a. m.)

AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 15, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF MILITARY AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, in the committee room, Capitol, at 10.30 o'clock a. m., Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN D. RYAN, DIRECTOR OF THE BUREAU OF AIRCRAFT PRODUCTION—Continued.

The CHAIRMAN. Mr. Ryan, have you received any reliable information in the past two or three days with regard to aviation conditions at the front?

Mr. RYAN. Yes, sir. Maj. Brett, who is connected with the overseas expeditionary force, or the aviation division of the American expeditionary force, has just returned. He had to do with the setting up and sending out of the De Haviland planes that were sent over there. He came back on a mission for the purpose of getting some help—some men and things. He told me that before he left they not only tried out the De Haviland plane, and that they had worked out very satisfactorily, but they had sent three squadrons to the front. They were on the front when he went there on July 31. The last one went from a point the name of which I have forgotten, but it is near Paris.

The CHAIRMAN. It is a large aviation camp?

Mr. RYAN. It is an aviation camp near Paris, where they get them ready to fly and then fly them to the front. They are put together at ———. They are assembled near Paris and flown to the front in squadrons. The third squadron had gone before he left there. He has had at first hand more to do with setting up and starting out the De Haviland planes that have been sent over than anyone we have in this country now.

The CHAIRMAN. I want to say at this point that I unexpectedly met Maj. Brett this morning. He tells me he is a member of the Regular Army and was assigned to this duty.

Mr. RYAN. He is not connected with the Bureau of Production. He is with the overseas service.

The CHAIRMAN. What information have you, if any, from Maj. Brett with regard to the number of planes that the American Expeditionary Force has?

(Informal discussion followed, which the reporter was directed not to record.)

Senator REED. Maj. Brett came over for the purpose of getting parts and accessories that they need over in France, I understood you to say, Mr. Ryan, a moment ago?

Mr. RYAN. Yes, sir.

Senator REED. As I understood your testimony before we adjourned the other day you were then of the opinion that the De Haviland, while not a machine that you regarded as in any respect perfect, was one that you hoped to be able to make considerable use of. That was about your opinion, was it not?

Mr. RYAN. Senator, I would say that perhaps that statement that I did not regard it in any respect perfect might be misunderstood. I do not think there is any perfect airplane—far from it. I do not regard the De Haviland that we are putting into production now, improved as it has been improved by these changes, of great military use. Until the time arrives when we can put into production the U. S. 9 or the U. S. 9-A, which are machines of the same general type as the De Haviland 4, it is my intention, as far as I have anything to do with continuing to produce the De Haviland 4's in quantity, to make such improvements as we can and not materially slow up production.

The CHAIRMAN. Always assuming, of course, that these structural and other changes shall be made?

Mr. RYAN. I think I stated that in the beginning.

The CHAIRMAN. You have held up production until that can be done?

Mr. RYAN. I have held up production until that can be done. We think production can start again by next Saturday.

The CHAIRMAN. Day after to-morrow?

Senator REED. That will mean that you will produce of the De Haviland 4's about how many machines?

Mr. RYAN. Probably from the 1st of September 30 machines a day; from the 1st of October 50 machines a day.

Senator REED. But how many do you contemplate having to produce before you get into production of the other kinds of machines that you just mentioned?

Mr. RYAN. That we can not tell accurately. It will be different times in the plants. Some of the plants will produce 9's earlier than the other plants, because their tools and jigs were made for the 9's.

Senator REED. What plants, for instance?

Mr. RYAN. The Fisher Body Co., for instance. However, the plants that are making the 4's ought to be into the 9's pretty well. I should say, by the middle of September or the 1st of October.

Senator REED. Getting into quantity production?

Mr. RYAN. We do not aim to slow up quantity production in going from 4's to 9's.

Senator REED. I understand. When you say you are going into 9's, you mean to produce in substantial numbers?

Mr. RYAN. Yes, sir; to produce in substantial numbers.

Senator REED. So, to put this thing in a word, you believe that the De Haviland 4 is of sufficient utility so that its manufacture should be proceeded with in quantity until you have developed and gone

into quantity production of the De Haviland 9, and also the other one? What is the other?

Mr. RYAN. I would not call them that. We call them the U. S. 9, and the U. S. 9-A, which we consider improvements.

Senator REED. But they really are similar, and are taken from it?

Mr. RYAN. They are taken from it; yes, sir.

Senator REED. What are the principal changes in the U. S. 9, and the U. S. 9-A?

Mr. RYAN. The U. S. 9 is much the same kind of a machine as the De Haviland 4. It has the observer and the pilot seated together, with only a thin partition between them. It is strengthened materially here and there in a number of places that I could not describe without the drawings and without the help of a technical man; and it would not be of any use in the record. It is, generally, an improved machine of the same general type as the D. H. 4. The 9-A is the same machine as the 9 with a larger wing spread. It is our intention to build the 9 and the 9-A interchangeably; that is, we can put the 9-A wings on the 9 machine. The 9-A will be used for slightly different purposes than the 9.

Senator REED. What are the different purposes?

Mr. RYAN. The 9-A will carry more bombs, having larger wings.

The CHAIRMAN. Can you give the wing spread?

Mr. RYAN. I can not do that accurately.

Senator REED. Are we making any fighting planes now—that is, a plane of attack?

Mr. RYAN. Yes, sir; the De Haviland 4.

Senator REED. You do not call that a plane of attack, do you?

Mr. RYAN. Certainly. I call it a combat plane; certainly. I do not call it a pursuit plane or a scouting plane, but I call it a combat plane.

Senator REED. I do not want to misunderstand the terms; but, as I understand it, the De Haviland 4 was intended for reconnaissance work and could be used for photographic work, but I did not know that anybody contended that it was a plane that you could send out and clear the air of German machines.

Mr. RYAN. It depends upon the German machines that are out. It is fitted with machine guns and with bombs. It is certainly fast, and is a good climber.

Senator REED. It is a good climber?

Mr. RYAN. Yes, sir.

Senator REED. It takes 45 minutes to go up 10,000 feet.

Mr. RYAN. That is not the fact, I think, Senator. I will give you the performance on that climb. We had it the other day, Senator. The De Haviland 4, equipped with a Liberty motor, has a ceiling of 19,700 feet and a speed of 118 miles an hour at 6,500 feet. It climbed 6,500 feet in 7 minutes and 2 seconds, with 4 guns—4 machine guns.

Senator REED. I can not understand those figures in connection with the ones that we have been given. They are utterly irreconcilable.

Mr. RYAN. I am willing to give these figures. They are under the stamp of the Bureau of Military Aeronautics. I am willing to put them in the record.

Senator REED. I do not challenge your statement. I simply say that I do not understand them. Was that climb made with a military load?

Mr. RYAN. These are secret documents. You will see that it says: "Service planes in use at the front, statistical branch, executive division, General Staff, War Department, July 25, 1918." Now, I can not put that in the record.

(Informal discussion followed.)

Senator REED. I do not believe that you answered my last question. Was that climb made with a military load?

Mr. RYAN. I do not know what climb you speak of. The record states that the plane was equipped with four guns; that is, the plane that made that climb.

Senator REED. That is not a full military load, is it?

Mr. RYAN. It was not carrying bombs, but it is equipped as a fighting machine.

Senator REED. If I understand you correctly, Mr. Ryan, you maintain that this De Haviland 4 is suitable for use as a combat plane; that is, as a plane of attack. Secondly, you say that it is suitable for use as a reconnaissance or a photographic plane. Thirdly, you say that it is of use as a day bomber; that you can use it over the line. It has all three of these uses combined in one. That is your opinion?

Mr. RYAN. I think we must misunderstand each other somewhat. When I say it is a combat plane, I contend that it is useful as a combat plane. In speaking of a plane of attack, you evidently speak of what we call a fighter. It is not that type of plane.

Senator REED. What do you mean by a combat plane?

Mr. RYAN. It is a plane that is so equipped that it can go out and take care of itself in combat. It is not the type known as a fighter.

Senator REED. How can it take care of itself in a combat with a fighter?

Mr. RYAN. It is not as maneuverable as a fighter, but it can take care of itself as a plane of its kind.

Senator REED. As a matter of fact, these machines to which you refer as combat machines, the primary purpose of which is observation, have some guns on them, and they are supposed to defend themselves, but they are not fighters in the sense of cleaning up the air and putting the other fellow out of business?

Mr. RYAN. They are not what is technically known as a fighter, but they are combat planes, and they can and do fight. Senator, to define what is known as a fighter, I will say that I mean a machine like the Bristol fighter or the S. E. 5. I mean a small, maneuverable, quick-acting machine that will not carry weight and can not be equipped with a large number of machine guns or any bombs: but the combat planes include fighters and bombing machines, such planes as the D. H. 4. They are all combat planes.

Senator REED. I have only one or two more questions to ask. We have no heavy bombing planes except the Handley-Page, and there is only one machine of that kind that has been made?

Mr. RYAN. We have shipped 20 machines.

Senator REED. Twenty Handley-Paige machines?

Mr. RYAN. I may not be exact. We have shipped 10 and there are 10 that were to have been shipped yesterday or the day before, and will certainly be shipped this week.

The CHAIRMAN. Do you mean the parts are shipped to be put together over there?

Mr. RYAN. Yes, sir.

Senator REED. You made the Handley-Page machine at the Standard Aircraft factory, and that was the first one equipped with the Liberty motor?

Mr. RYAN. I think so.

Senator REED. That machine was tried out at the Standard Aircraft factory?

Mr. RYAN. Just a moment. I think that the Liberty motors were used quite extensively in the Handley-Page machines on the other side before this plane was built at Elizabeth, N. J.

Senator REED. Why did they take so much time planning the machine if the motor was tried out over there?

Mr. RYAN. I do not know that they did.

Senator REED. I want to know how much of a test was given down here before you began to produce in quantities?

Mr. RYAN. I think the test was made on the other side. I think the Handley-Page with the Liberty motor was tried out on the other side before it was tried out here.

Senator REED. That is, before it was made here?

Mr. RYAN. Yes; or during that time.

Senator REED. Were the machines on the other side identical with the machine made here?

Mr. RYAN. Not exactly, but near enough so that I think any demonstration that was conclusive on the other side would not be affected by any change in construction.

Senator REED. You mean that the changes were so slight that they could not have affected the performance of the planes disadvantageously?

Mr. RYAN. I think so.

Senator REED. I want to know if you are sure that this Handley-Page which was very nearly identical with the one made down here had been tried out on the other side with the Liberty motor?

Mr. RYAN. I am quite sure it was.

Senator REED. When was it tried out?

Mr. RYAN. I can not give you accurate data.

Senator REED. Who would have that data?

Mr. RYAN. I do not know that anybody would. The people we relied on, who brought us information regarding the Handley-Page machines, have gone abroad. I imagine we could get the information from the English commission.

Senator REED. I understood, though I may have been in error, that this Handley-Page which was made had to be redesigned in order to receive the Liberty motor.

Mr. RYAN. I think that is true, to some extent.

Senator REED. Of course, if it was redesigned on the other side for the Liberty motor, it would not have to be redesigned here for the Liberty motor.

Mr. RYAN. I think the original drawings that came over provided for the Rolls-Royce engine, but the change was not material.

The CHAIRMAN. My recollection is that the chief changes were with what they call the nacelle, in the shape of the engine.

Mr. RYAN. I think that would be so.

Senator REED. What I want to get at with absolute certainty is that this Handley-Page machine was tried out—thoroughly tried out—with the Liberty motor before the machine made at the Standard Aircraft Works was constructed, and that the machine there made is a substantial copy of the one abroad. In other words, I want to know that this machine which we are now making has actually been tested out with a Liberty motor, because my own opinion is, to make a somewhat long statement, that a machine may be perfected with a certain engine in it, but when you change engines you may have a machine that is a complete failure because the machine and the engine do not fit. I am very much concerned about that question, whether or not this Handley-Page was really tried out in England with the Liberty motor.

Mr. RYAN. I think our main reliance, Senator, on that point came from the fact that the English had been doing everything possible to get us to give up, as fast as possible, all the Liberty motors that we could, so that they might put them in the Handley-Page machine and other bombing machines, after the Liberty engine had been tried on the other side.

Senator REED. I understood that a very eminent Englishman stated that if we would send them Liberty motors they would build machines that would fit, the inference being very broad that we did not know enough to build them.

Mr. RYAN. Senator, a cable on the 2d of July from the British minister of the air stated that they would have to stop production of the Handley-Page machine in two weeks unless we could furnish engines to put in them; that their Rolls-Royce production had not been up to expectations, and that they were dependent absolutely upon our shipments of Liberty motors for the Handley-Page machine, and would have to stop production in two weeks if they did not come.

Senator REED. I have pursued that as far as I care to, because I must go in a few minutes. You have produced how many of these machines up to date?

Mr. RYAN. Twenty have been shipped, I think. I think 30 machines have been shipped or are ready for shipment. That is my information this morning.

Senator REED. You are going to be able to produce them how fast?

Mr. RYAN. We expect to ship 30 in August. This is approximate, of course. We will ship 60 in September, 80 in October, running up to a maximum of 140 machines a month, which will be reached in February.

Senator NEW. Handley-Pages?

Mr. RYAN. Yes, sir.

Senator REED. How many factories are working at that?

Mr. RYAN. A number of factories are making different parts. The wood parts are being made in Grand Rapids. The metal parts are being made at certain other places.

Senator REED. Who is doing the assembling? Are several different factories doing it?

Mr. RYAN. The parts are all shipped to the Standard Aircraft Works at New Jersey, and the parts are shipped from there to England, and the assembling is done in England.

Senator REED. With the exception of one or two tests that you had with this Handley-Page machine when they had that big meeting and speeches were made, and so on, and when some flyers took the machine out and flew it around, what tests have they given?

Mr. RYAN. I do not know that any tests have been made to determine whether it was a machine that we wanted to go into production on. As I say, we are relying on the experience of the English with the Liberty motor.

Senator REED. Have you been making tests with these other machines? Have they been sent out to the testing ground?

Mr. RYAN. No.

Senator REED. You are in quantity production without having put one of those machines through a testing station?

Mr. RYAN. Yes, sir.

Senator REED. If you will pardon me, that has been the occasion of our trouble heretofore.

The CHAIRMAN. You are not producing and testing and assembling here, but you are producing parts and they are being sent to England, and the tests are made there after they go to the front?

Mr. RYAN. Yes, sir.

Senator REED. Are none assembled here?

Mr. RYAN. One in so many. I think one in 25 or 30 machines is to be assembled in this country and used in tests and flights here.

Senator REED. Just let me ask the committee to do this. I wish the committee would follow this same line of investigation with regard to the Caproni. I would like to know what became of our Italian friends.

Senator NEW. I would like to ask a question, if I may. Have you any knowledge, Mr. Ryan, as to how long it would take to assemble those machines and put them into commission after the parts have been received on the other side?

Mr. RYAN. After the parts have been received on the other side, 60 days. We think 120 days from the time that the parts are ready will be sufficient to have the machines on the front.

Senator NEW. But the point I wish to develop is that it will require approximately three months to assemble the machine and put it in operation after the parts have been received on the other side?

Mr. RYAN. Sixty days.

The CHAIRMAN. This arrangement to which you have just referred was the result of a previous understanding with the British aviation authorities?

Mr. RYAN. You mean the assembly of the Handley-Page?

The CHAIRMAN. Yes.

Mr. RYAN. I think so; but they are doing it for us. It is our operation. We have sent people there to be trained and work into the thing. There is an agreement with them.

Maj. CAMPBELL. There is a contract.

The CHAIRMAN. When the machines are assembled and tested they are turned over to the Army, to Gen. Pershing? After the machines are assembled and tested, do they belong to the Army or to the English?

Mr. RYAN. To the American Army.

The CHAIRMAN. You say 10 have been sent?

Mr. RYAN. I am sure of 10, and the other 10 were to have gone yesterday or the day before.

The CHAIRMAN. You expect to have how many in February?

Mr. RYAN. One hundred and forty or 150 a month.

The CHAIRMAN. And after that?

Mr. RYAN. That will be the maximum. That is the maximum under the present plan.

The CHAIRMAN. Is this arrangement for the assembling of the parts in England in any manner due to the problem of transportation?

Mr. RYAN. Very largely due to it.

The CHAIRMAN. It is a saving of space and time?

Mr. RYAN. A very large saving of space and time.

The CHAIRMAN. That is because of the size of the machine?

Mr. RYAN. Yes, sir. They will save our aviation centers in France, which, at the best, are bound to be congested. They are bound to be congested from handling these great big machines. When they are put together in England they will be flown directly to the front.

The CHAIRMAN. How many of these machines are to be built and assembled that way?

Mr. RYAN. A thousand under the present contract.

The CHAIRMAN. Under the present contract?

Mr. RYAN. Yes, sir.

The CHAIRMAN. Coming to the Caproni, have the tests of the Caproni machine so far advanced as that you have entered into production?

Mr. RYAN. We have not entered into production. We have been trying to push the engineering work on the drawings. We have started work on the metal parts, because they are the parts that will delay construction when we do get into production. The Caproni machine has not been tested out fully to our satisfaction here, because the Caproni pilots who were sent to test out that machine have been killed; that is, two have been killed, not in that machine, or even one like it, but in machines.

The CHAIRMAN. One was killed in a Caproni machine?

Mr. RYAN. One was killed in a Caproni machine, but not one similar to this one. This week Capt. D'Annunzio, Caproni's engineer, has gone to Detroit and promised to stay there and push the work. The pilot from Italy to fly this Caproni machine that was built at Elizabeth is expected in New York to-day or to-morrow.

The CHAIRMAN. In other words, the Caproni program is held up in part because of the absence of competent Italian flyers to make the appropriate tests?

Mr. RYAN. I do not know, Senator, that we are actually losing time on it, because we are making the metal parts, the slow things to go into production on. Those things will not run into a large amount of money, even if the tests should fail and we should condemn the machine. It would not mean a great loss in the progress

that we are making now to insure production as soon as the tests are proven to be satisfactory.

The CHAIRMAN. When you were on the stand before you were asked regarding your authority in aviation production, and you made the statement that you regarded yourself as being the official having ultimate authority in those matters. Is it not true that you and Gen. Kenly have a working agreement, approved by the Chief of Staff, regarding the manner in which the types of machines to be constructed are designed or tested, or both, by the military bureau of aeronautics?

Mr. RYAN. Senator, if you do not mind, that is the department of military aeronautics. I know that you want the correct term.

The CHAIRMAN. Yes. Your department then is to produce such a machine?

Mr. RYAN. There is not any actual agreement, Senator, between the department of military aeronautics and the Aircraft Production Bureau, but a general understanding between Gen. Kenly and myself.

(Informal discussion followed.)

The CHAIRMAN. Gen. Kenly stated that there was an agreement that existed between you and himself.

Mr. RYAN. It was understood that we were both trying to reach a working basis so as to facilitate production and give the department of military aeronautics all of the opportunity to test and try out machines and advise us with respect to them so that we could still maintain production.

The CHAIRMAN. Is it the intention, as soon as the sample machines are tried out and tested, to enter also upon their production?

Mr. RYAN. We expect to build, as soon as it can be done, upon the conclusion of satisfactory tests, a thousand of that particular type of Caproni, each with three Liberty 8-cylinder engines.

The CHAIRMAN. Liberty eights?

Mr. RYAN. Yes. We expect to try both the Liberty 8 and the Liberty 12. It is our judgment, or the judgment of the best informed men we have, that the Liberty motor will be the most effective engine in the Caproni machine.

The CHAIRMAN. How soon do you expect to be in production of the Liberty 8?

Mr. RYAN. Some time in December.

The CHAIRMAN. What concerns are to manufacture them?

Mr. RYAN. I think the Buick is the one we expect the first production from, and the principal production.

The CHAIRMAN. Has the Buick Co.'s contract for the 12's been canceled?

Mr. RYAN. No. The Buick and the Cadillac are owned by the General Motors Co. The General Motors Co. took the contract and started work on the Liberty 12 in both places—the Buick and the Cadillac plants. Upon their receiving a contract for the Liberty 8, as I understand it, they intend to put the Liberty 12 production into the Cadillac plant and the Liberty 8 in the Buick. They are very much the same; there are only a few parts that are not identical.

The CHAIRMAN. Has the contract been let for them?

Mr. RYAN. I do not know that it has been actually signed, but it is understood.

The CHAIRMAN. What is the estimate of price on the Liberty 8?

Mr. RYAN. We do not think it will be far from \$3,000.

Senator NEW. Mr. Ryan, I want to call your attention to the evidence elicited by this committee from some of the flyers who have been before it, especially with reference to the De Haviland 4 machine. Take, first, Capt. J. H. Kelley. Do you know Capt. Kelley?

Mr. RYAN. No, sir; I do not know him.

(Senator New here read aloud from page 1052 of the record from the testimony of Capt. J. H. Kelley, setting out Capt. Kelley's qualifications.)

Senator NEW. In response to a question by Senator Reed as to what opportunity he (Capt. Kelley) had had to observe the De Haviland 4 as built in this country, he said that he had arrived for duty July 15 at Wilbur Wright Field and inspected for his satisfaction the American-built De Haviland 4's. He says:

After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing the reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion the machine is not safe to fly. I mean to fly. I mean to say it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

That is scarcely to be regarded as a favorable opinion by a man of large experience?

Mr. RYAN. I do not know Capt. Kelley.

Senator NEW. Capt. Kelley is just what I have explained to you.

Mr. RYAN. That is his own statement. I have never seen him. I would not know what credence to put in his statement, or what reliance to place on his judgment as to the machine.

Senator NEW. Senator Reed also asked something as to structural defects, to which Capt. Kelley replied, among other things:

The tail plane on its leading edge is spliced. You can take hold of the outside of the tail plane and show a play of at least an inch from where it is spliced to the edge. It is spliced about a foot away from the edge. Where the tail plane is attached to the fuselage there is a very decided play. It must be one-eighth of an inch, so that when the machine is in flight there will be constantly a vibration on that which you must get away from.

Then, further on, he says:

Where the tail plane is attached to the fuselage on its leading edge are two small wires. The late construction on all heavy machines, and on some light machines, is a metal tube going from the leading edge to your fuselage, making that tail plane solid, as it should be.

Still further on he says:

On inspecting a machine that had done about 60 hours' flying I found that both front bolts had been bent and all eight holes had been enlarged by the constant vibration until there was a play in each hole of at least a quarter of an inch; one of them was about half an inch.

Then Senator Reed asked:

Those - - - through what?

Capt. Kelley replied:

Through the wood. There are four spars on each side, and they take the strain off the wings. The fitting from the fuselage onto these main spars is too short. None of these holes are metal bushed, so that the least play or vibration allows the bolts to chew into the wood, enlarging the hole, and making the machine very dangerous.

Then I asked him to be a little more specific about the danger that would result from the loosening of this bolt hole. He replied:

By these holes becoming enlarged and bending the bolts in ordinary maneuvers the wing is very liable to drop off, which, of course, would kill whoever was in the machine.

Further on, with reference to the same reported defect, he said:

The effect would be that the wings would fall off in the air after 3 to 10 hours, depending upon the strain which would allow that to give. It might be flown for five hours and that particular strain not be put on it.

Senator Reed then asked:

But that machine was delivered for service?

Capt. Kelley replied:

Yes, sir.

Now, is there anything that you can say, Mr. Ryan, or that you care to say about that testimony further than the reply you have already made?

Mr. RYAN. Of course, I do not know anything about that particular machine, but if I understand the testimony correctly, the machine had been flown 60 hours, which is quite a considerable performance for a defective machine, and it is very likely that repairs or maintenance should have been made on the machine after any such period of flight as 60 hours. That is a pretty long service to get without extensive repairs.

Senator New. He said:

About June 22 or 23, when I was in Paris, I met a pilot who had flown the American-built D. H. 4. What his name was I can not remember. I asked him his opinion of the machine and he told me it was the poorest job he had ever seen on an airplane, and that he did not like to fly in it at all, and would not fly it unless he was ordered to do so.

Further on he said:

So far as I know, I can not find out what the D. H. is to be used for, so far as the American Army is concerned; but such a combination as a reconnaissance, bombing, and fighting machine—by that, I mean carrying a load of bombs sufficient to go over and do some damage—I do not mean 50 or 60 or 100 pounds of bombs, but enough to do some damage—I do not know of such a machine at all.

That goes to the value of the machine for more than one purpose.

Mr. RYAN. I do not think any of us, Senator, would claim that the D. H. 4 was a fighter, observation plane, and bombing machine of great size, all in one, but it is an observation and bombing machine of a size that gives it great military use and makes it a very effective machine.

Senator New. I want to call your attention to the testimony of Maj. Muhlenberg, or to just one point in it, at least. Do you know Maj. Muhlenberg?

Mr. RYAN. Yes, sir; I met him at Dayton.

Senator New. I asked him if he were satisfied from his observations with the present conditions of the De Haviland 4 machine, to which he replied:

No, sir. It is by no means the machine we want for a fighter nor the machine we want for a bomber. As a reconnaissance machine, and, possibly as an artillery observation machine, it would be all right, but certainly not as a fighter nor as a bombing machine. It will not fill the bill of either one.

Do you agree with that?

Mr. RYAN. Of course, he is right. It is not a fighter. We do not class it as a fighter. When he speaks of bombing machines he probably means bombing machines of great size and radius. It is not that. We have got to have machines in between those machines. In between those machines a great deal of space is to be occupied, not only by machines of the De Haviland 4 class, but other machines. There is a wide range between the big bombing machines and the fighter that has got to be covered by several types of machines and can not be covered by any one.

Senator New. Maj. Muhlenberg also says, in answer to a question asking him to speak of some of the structural defects:

There are three or four points in which it is not strong enough. * * * I wish to draw your attention here to the two nose drift wires. These two wires [indicating] both run to the same fitting. * * * These two wires run to the top and bottom, respectively, of the first strut, and are the only effective means of preventing the wings sweeping back in a dive.

Do you know whether anything has been done to correct that particular defect?

Mr. RYAN. I do not know, Senator. I am not familiar with the engineering features of the planes, nor am I capable of judging.

Senator New. With reference to the matter of the organization. Chairman Thomas asked Col. Bane a question, to which he replied in part as follows:

There is no head or chief of the air service. A single head to the two divisions could quickly, by the use of common sense, settle many questions that now remain unsettled or must be carried to the Secretary of War. The result is that we get nowhere. We are unable to get anywhere. No one is running us. We feel that it is vitally wrong and that there should be a common head to go to and force the other man to listen to reason.

Do you think that is a correct statement of the situation?

Mr. RYAN. I would not coincide entirely. I think it is very desirable that there should be one head to anything and everything, particularly one head to a thing like production and the use of aircraft. I think they have got to go together.

Senator New. Mr. Ryan, on that subject, don't you think it is absolutely necessary that there should be one head to any big enterprise?

Mr. RYAN. I think it is very desirable.

Senator New. Having complete and absolute control of the organization, whatever it may be, whether it is aircraft or anything else?

Mr. RYAN. I think it is very desirable.

Senator New. Don't you think it is essential?

Mr. RYAN. Well, I do not know. Of course, I would not say that a business might not be successful that had two men in two different departments.

The CHAIRMAN. You never heard of such a thing, did you?

Mr. RYAN. It is not often that you find that such a thing is the case. Businesses that are not concentrated are not, as a rule, successful.

The CHAIRMAN. You can not divide authority without dividing responsibility?

Mr. RYAN. That can not very well be done. I will tell you how it works in this aircraft production business. If one department had the use and the real say so as to the types and another had production, and both were trying to play safe, there would not be any production. You have got this evidence from some of these flyers and some of the engineers with regard to the De Haviland planes, and the men who are producing the De Haviland planes want to be sure that their reputation does not suffer. As soon as they hear a criticism they stop production. Now, some one has got to be at the head of it and take the responsibility. Unless some one takes the responsibility on both sides and says when the argument and discussion shall cease and the work shall commence, of course you do not get very far.

Senator NEW. A man must have complete authority in order to do that?

Mr. RYAN. Yes, sir; he should have.

The CHAIRMAN. That is one thing all of our witnesses agree on.

Senator NEW. I think that is all I care to ask.

Mr. RYAN. Senator Reed asked the other day for some figures. Maj. Campbell has those figures.

The CHAIRMAN. What he wanted in terms was the amount of the expenditures.

Mr. RYAN. As I recall it, he wanted the total expenditures up to the time I took hold. We haven't that date exactly. That was May 20. We have the figures as of May 31. Would that be acceptable? [Addressing Maj. Campbell:] Major, on May 31, what was the total amount of money that had been expended for the production of aircraft?

Maj. CAMPBELL. \$370,369,942.60.

Mr. RYAN. Now, from that we will deduct the amount of money that was advanced to manufacturers, and that will come back upon the completion of their contracts. Give that amount.

Maj. CAMPBELL. \$24,971,871.10.

Mr. RYAN. Now, give it for the sales of materials to the allies and others.

Maj. CAMPBELL. \$11,161,708.

Mr. RYAN. Leaving a balance of expenditure as of May 31 that would represent the amount of money actually paid out that would not come back——

Maj. CAMPBELL (interposing). Of \$334,236,363.50.

Mr. RYAN. Give the total commitments on May 31.

Maj. CAMPBELL. They were \$764,115,582.09.

Mr. RYAN. I think that is what Senator Reed asked for.

Senator NEW. Yes; I think that is what Senator Reed wanted, Mr. Ryan.

(Whereupon, at 12 o'clock noon, the committee adjourned to meet at the call of the chairman.)

AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 16, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 2.30 o'clock p. m., in the committee room, Capitol Building, Senator James A. Reed presiding.

Present: Senators New and Reed.

The CHAIRMAN. We will now hear Maj. Brett.

STATEMENT OF MAJ. G. H. BRETT.

Senator REED. You are in the flying corps?

Maj. BRETT. Yes, sir; I am in the air service.

Senator REED. How long have you been in the air service?

Maj. BRETT. I have been in the air service since October, 1915.

Senator REED. What were you before?

Maj. BRETT. I was second lieutenant in the Cavalry.

Senator REED. Are you a graduate of West Point?

Maj. BRETT. No, sir.

Senator REED. How long have you been in the Army?

Maj. BRETT. I have been in the Army a little over eight years.

Senator REED. Did you enter as a private?

Maj. BRETT. No, sir; as a second lieutenant of the Philippine Scouts, and I served a year and two months as a lieutenant in that service, and then I was commissioned in the Regular Service.

Senator REED. Then, you remained in the Cavalry until October, 1915, when you went into the air service?

Maj. BRETT. Yes; I am still in the Cavalry. I am at the present time a temporary major of Cavalry, but detailed to the air service.

Senator REED. And you have been detailed since October, 1915, to the air service?

Maj. BRETT. Yes, sir.

Senator REED. What have you been doing in the air service?

Maj. BRETT. I took the eight months' course at San Diego, the flying course, and passed my qualification test in July, 1916. Then, due to the fact that there was an operation necessary, I came to Washington and was detailed in the office of the Chief Signal Officer on the 1st of September, 1916, for temporary duty. I worked in his office until the first of September, 1917. Then I went to the hospital and stayed there during September. I was on sick leave, supposedly on sick leave, although I was working during the entire

time during the month of October, 1917, and I sailed for France on October 29, 1917.

Senator REED. Have you been there ever since until you returned?

Maj. BRETT. Until last Sunday, when I arrived in the United States. I am sailing again on the 1st of September.

Senator REED. Your total practical experience in this country, then, with the flying machines was in taking the eight months' flying course?

Maj. BRETT. Yes, sir; that is, of actual flying.

Senator REED. The rest of the time you were in the Signal Corps?

Maj. BRETT. I was in the aeronautical end of the Chief Signal Officer's office.

Senator REED. What were you doing in the aeronautical end of the Chief Signal Officer's office?

Maj. BRETT. I was under Col. Wallace in what is called the financial supply division. We bought all the matériel, airplanes, etc., for the then aviation section of the Signal Corps and paid for the same. I remained in that place until the advent of—there was Col. Thompson and Col. Waldon and Mr. Coffin. They all came in about the time that I left.

Senator REED. You went to France, you have stated, about the last of October, 1917, and have been there since. What have you been doing in France?

Maj. BRETT. I am chief of the matériel division of the supply section of the A. E. F., which means that I handled every bit of material with the exception of furnishing airplanes and furnishing airplane parts and motors and balloon material which is purchased in France comes from the United States.

Senator REED. You have not been doing any flying over there yourself?

Maj. BRETT. Yes, sir; I have done flying, but purely——

Senator REED. You have gone up as a passenger?

Maj. BRETT. I have operated machines also.

Senator REED. To what extent?

Maj. BRETT. To a very minor extent.

Senator REED. Just a few times?

Maj. BRETT. Just a few times.

Senator REED. Without in any way disparaging your ability, I suppose we might say that you are a graduated flyer, but that you have not had much practical experience.

Maj. BRETT. Yes, sir; that would be correct.

Senator REED. You have not had any practical experience in operating planes over the battle lines?

Maj. BRETT. No, sir.

Senator REED. How many flights did you make in France yourself; that is, where you operated the machine?

Maj. BRETT. I probably made 15 or 20.

Senator REED. Short flights?

Maj. BRETT. Yes, sir.

Senator REED. In what machines?

Maj. BRETT. Training machines; that is, the French type of training machines.

Senator REED. You never flew in a pursuit plane?

Maj. BRETT. No, sir; a pursuit plane is a monoplane.

Senator REED. Well, they have pursuit planes which carry two passengers now, do they not?

Maj. BRETT. Very few. They have a fighting machine which is called a biplane fighter.

Senator REED. You never flew in a Spad or S. E. 5?

Maj. BRETT. No, sir; I have flown in the two-place Spad.

Senator REED. Did you ever fly in the Caproni?

Maj. BRETT. No, sir.

Senator REED. Did you ever fly in the Handley-Page?

Maj. BRETT. No, sir.

Senator REED. Did you ever fly in the Bristol fighter?

Maj. BRETT. No, sir.

Senator REED. Neither American nor English?

Maj. BRETT. Neither one.

Senator REED. Did you ever fly in a De Haviland?

Maj. BRETT. Yes, sir; as passenger.

Senator REED. When?

Maj. BRETT. About three weeks before I left France.

Senator REED. What was it, a 9 or 4?

Maj. BRETT. It was a 4.

Senator REED. How many times did you fly in it?

Maj. BRETT. I took one trip.

Senator REED. How long were you up?

Maj. BRETT. Probably 20 to 25 minutes.

Senator REED. Who operated the machine?

Maj. BRETT. I do not know the man's name. He was a test pilot at the production center No. 2.

Senator REED. How many De Haviland 4's were there on the front when you left France?

Maj. BRETT. I was informed on the day that I left France that there were three squadrons completely equipped with airplanes, personnel, and matériel in the zone of the armies, ready to go to work, composed of 18 machines to a squadron.

Senator REED. In the zone of the armies means somewhere in France?

Maj. BRETT. No, sir; in a locality where they are in a position to operate over the lines at a place called Amanty.

Senator REED. Were they De Haviland 4's?

Maj. BRETT. Yes, sir; with minor changes.

Senator REED. Eighteen to a squadron?

Maj. BRETT. Yes, sir.

Senator REED. That would be 54 machines?

Maj. BRETT. Yes, sir.

Senator REED. Who gave you that information?

Maj. BRETT. Col. Dunwoodie, chief of the supply section.

Senator REED. What date was it that you got this information?

Maj. BRETT. The 30th of July.

Senator REED. You did not see the planes yourself?

Maj. BRETT. I did not.

Senator REED. How did Col. Dunwoodie come to tell you this?

Maj. BRETT. Because one of his duties is to provide all equipment and airplanes for the squadrons going to the front. In the supply section that is one of his duties.

Senator REED. How long have these planes been there?

Maj. BRETT. As I understand, they were flown from Amanty to the park at Arlie on the 28th, 29th, and 30th of July.

Senator REED. How long a flight is that?

Maj. BRETT. Approximately 125 miles.

Senator REED. Were these machines in the condition that they had been delivered from America or had they had the changes made in them to remedy the defects which had been discovered?

Maj. BRETT. They had had changes made in them.

Senator REED. Do you know what those changes were?

Maj. BRETT. They were all minor changes. There is a V coming down from the fusilage to the axle. It was found that the V would separate on landing. One change was a small steel plate placed in there to strengthen that. Another change was a pair of metal struts running from the tail stabilizer down to the rudder post.

Senator REED. For what reason?

Maj. BRETT. Because it was claimed that the stabilizer was not strong enough to stand the terrific strain of acrobatics.

Senator REED. It not only was claimed but it was demonstrated. was it not?

Maj. BRETT. It was demonstrated that the machine was weak.

Senator REED. It had also been demonstrated that the machine was weak at this other place that you refer to as the V where it separated?

Maj. BRETT. Yes, sir.

Senator REED. What other defects were there?

Maj. BRETT. There was a defect in the construction of the gravity-feed gasoline tank in that they did not take the precaution to handle an overflow; merely a small mechanical change whereby a drainage pipe was run from the overhead gasoline tank down so that in case too much gasoline was pumped the gasoline would flow out from underneath and there was a change in the carburetor.

Senator REED. A change in the carburetor might be important. might it not?

Maj. BRETT. The motor and the airplane, when they first arrived in France, were subject to the severest criticism by our own people. We had three or four men who were theorists. Their idea was that a motor or a plane were no good unless they were perfect. They worked with the plane and with the motor for approximately three or four weeks, I should say.

Senator NEW. It is understood that the Liberty motor is in use in these planes.

Maj. BRETT. Absolutely; yes, sir. Col. Kilmer, in charge of Issender, which is our biggest training school in France, and which is a model of efficiency, asked that he be sent some of these planes and he was sent four of these planes. Col. Kilmer was commended by the Secretary of War. He put his practical men on the airplane and the motor and they rectified these small mistakes, that were real minor jobs, and flew the machines. After his men had played with them for a while, as you might say, they took these machines and did every stunt in the air that they can do with any chase machine. Every man in the school was keen for an opportunity to fly the machine. The pilots were enthusiastic about it. They

changed the carburetor. They found it was getting too much gasoline, so they put outside scoops to force more air into the carburetor to equalize the mixture. They found a certain minor defect in the oil pump in the engine itself, so, in order not to feed so much oil, they bored a couple of holes in the pump whereby, when the piston was forced down, a certain amount of oil would come back of the piston and only a certain amount would be forced back into the engine; and other minor changes of that character, which any practical man would pick up.

Senator REED. You said that the machines first arrived some 30 days ago. Was that when they first arrived?

Maj. BRETT. No, sir. Those machines have been coming into France. There were 354 of them in France on the 31st of July and they had been coming in on the average of about 45 a week prior to that time, as I remember my figures. They started to come in about the 1st of May.

Senator REED. Do you think there were as many as 45 engines over there on the 1st of May?

Maj. BRETT. I can not say offhand, but I moved to Paris on May 12, and as soon as I got to Paris I took up with the people in authority the fact that they must immediately prepare to receive De Havilands, that they were coming in much faster than we had anticipated and at that time, as I remember, I had figures which were based on approximately 45 machines a week.

Senator REED. Did the machines come in in conformity with your figures?

Maj. BRETT. Yes, sir; practically straight throughout at that rate.

Senator REED. Who were these theorists who spent some 30 days and practically condemned the machine?

Maj. BRETT. They were in the supply section in Paris. Maj. Riley was in charge of the engines and there was not so much fault found with the airplane itself as with the motor and it came back on us and I happened to be the second ranking official at the headquarters in Paris and rumors of criticisms came back from the French and I told the officers assembled there that it was absolutely their own fault because they had pulled the motor to pieces and it was time for us to do some boosting and not make so many criticisms.

Senator REED. So you became a booster?

Maj. BRETT. Yes, sir; I have always been a booster since I saw the first flight. I knew an officer who had tested English airplanes for some four years and I asked his candid opinion and he said that it was the sweetest and most responsive motor we have for training and the airplane was one of the easiest handled machines he had ever driven.

Senator REED. You say that the French flyers, however, had condemned it.

Maj. BRETT. Only from a critical standpoint. Some lieutenant would hear somebody higher up say that this was the matter with the De Haviland or the Liberty——

Senator REED. But you found that continuously, so you say, lots of them had condemned the machine?

Maj. BRETT. Yes, sir.

Senator REED. And one of those was Maj. Riley, who was in charge of the engines?

Maj. BRETT. Yes, sir; he was.

Senator REED. And there was a general feeling of that kind so that you thought it was necessary to boost as against the knockers.

Maj. BRETT. Yes, sir; I do not believe in tearing your own work to pieces until you find out whether it is satisfactory.

Senator REED. There were a good many of these knockers?

Maj. BRETT. Yes, sir; in a small circle.

Senator REED. And all that the knockers said was offset in your own mind by the statement of one British pilot that he thought the machine a very excellent machine.

Maj. BRETT. Yes, sir. Also with other men; I have talked with American pilots. Lieut. ——— made a trip from ——— to ———.

Senator REED. You are speaking now of somebody on this side that we could get?

Maj. BRETT. No, sir; he is still on the other side. He flew the machine from Production Center to Arlie, and I happened to be present when he landed and asked him what he thought about it and he was very keen on the machine.

Senator REED. How many accidents have they had over there on these machines?

Maj. BRETT. I could not say offhand.

Senator REED. There have been a number?

Maj. BRETT. Yes, sir; but I would not say out of proportion to the accidents on other types of machines.

Senator REED. In how many cases have you had accidents due to a defect in the machine?

Maj. BRETT. Quite a few on the landing gear.

Senator REED. How many times has the canvas on the wings loosened?

Maj. BRETT. I could not say.

Senator REED. That has happened frequently, has it not?

Maj. BRETT. I have never heard of that complaint, sir.

Senator REED. I want to ask you whether your attention has been called to this, that the rubber cords for shock absorbers were incorrectly made, the rubber strands not being put under sufficient tension before being covered, and the result is that the estimated weight is too much for underload.

Maj. BRETT. I know that.

Senator REED. Do you regard that as a kind of defect that ought to be remedied?

Maj. BRETT. Yes, sir; it is a defect which is being remedied.

Senator REED. I am asking if it was a defect?

Maj. BRETT. Yes, sir.

Senator REED. Was it in these machines when they first came over?

Maj. BRETT. Yes, sir; it was. I do not know as I consider it a serious defect.

Senator REED. You know of the absence of check cables; that is, that there were no such cables applied to check axles from forcibly striking the running gear V and struts, which are permitted to strike the ground.

Maj. BRETT. That was due to this weak shock absorber cable.

Senator REED. How many men were hurt because of that over in France?

Maj. BRETT. I could not say. I do not know of anybody who was hurt directly from that point.

Senator REED. Were there some of the flyers hurt over there?

Maj. BRETT. I know a personal friend of mine who made a flight in the De Haviland; when he came down the landing gear broke and the machine nosed up, and outside of a little bump on the head he was not hurt. He was a passenger.

Senator REED. How many men?

Maj. BRETT. I could not say.

Senator REED. Is it or is it not a pretty serious thing to have a machine go to pieces when you land on the ground?

Maj. BRETT. Yes, sir; it is. Understand, Senator, that my knowledge of all these points that you are asking for is purely from observation and hearsay. That is not my line of work, and I am only giving you information which I have picked up from conversations.

Senator REED. Of course, you would not say that your information or any opinion which you have formed from the information which you have picked up in that way would be comparable with the information from Gen. Pershing, based upon an investigation by his officers appointed for that purpose?

Maj. BRETT. No, sir; I would not, except that I would like to hear that information if I may.

Senator REED. I have been reading you some of that information.

Maj. BRETT. Those opinions were largely made up in the office, in which I was working.

Senator REED. You do not think that Gen. Pershing would send over a lot of criticisms unless they were pretty well founded?

Maj. BRETT. Unless the theorists made a lot of criticisms which were later rectified by practical men.

Senator REED. You think they might have put them over on Gen. Pershing?

Maj. BRETT. Gen. Pershing never sees the cables. I write many cables myself. If the chief of the air service approves of the cable, it goes through.

Senator REED. You have heard two things from this which you say were correctly stated. Let me see if this is correctly stated: The tail plane is of old type and should be braced with stream-line tubes extending from the leading edges to the lower longeron of fusilage. That was a weakness which has been corrected over there and ordered over here.

Maj. BRETT. Yes, sir.

Senator REED. Supposing that had not been done and the tail had given away, what would be the effect on the flyer in the air?

Maj. BRETT. There would be a crash.

Senator REED. That weakness you would not call a minor weakness, a weakness which would cause a crash?

Maj. BRETT. My word "minor" was used in connection with the quantity of work which would be done to rectify the mistake.

Senator REED. The mistake might be fatal in itself, but it would not take a great amount of work to rectify in some instances?

Maj. BRETT. Yes, sir.

Senator REED. Possibly this old type of tail should be replaced by a new type of tail plane. With a new type of tail plane stream lines would not be necessary.

Maj. BRETT. That is a technical point and I could not say.

Senator REED. Had you observed that wood screws had been used in various parts of the machine instead of bolts?

Maj. BRETT. I have heard that report.

Senator REED. Is that a defect which might be cured?

Maj. BRETT. I could not say offhand. From the discussion I heard on that subject, which was at the production center, they stated, as I remember it, that the possibility of weakness by boring the tail to put the bolt through might offset the strength added to the machine by the use of the bolt.

Senator REED. You heard somebody state that?

Maj. BRETT. Yes, sir; it was a discussion.

Senator REED. But Gen. Pershing departs in substance and effect from the desirability of changing it.

Maj. BRETT. Yes, sir.

Senator REED. I continue reading from where I stopped: "Notably on washer plates at points where tail advancing without tubes passes through fusilage and on wing-skid fastening." Again: "Nuts have been omitted in securing bolts." What does that mean, bolts put in without a nut on them?

Maj. BRETT. Yes, sir.

Senator REED. That is absolutely inexcusable.

Maj. BRETT. Yes, sir.

Senator REED. That also indicates the grossest carelessness in inspection.

Maj. BRETT. Yes, sir; that is where the fault would lie, in inspection.

Senator REED. And also on the man who failed to put on a nut?

Maj. BRETT. Yes, sir.

Senator REED. And next on the factory inspector who failed to observe it?

Maj. BRETT. Yes, sir.

Senator REED. And next on the military inspector who fails to observe it?

Maj. BRETT. Yes, sir.

Senator REED. Did you observe this:

Bolts, shackles, and cotter pins throughout the machine are in many cases loosely and badly fitted.

Maj. BRETT. I could not say that I have observed it, but I heard that they were very carelessly put together in certain instances.

Senator REED. But it is not a very good policy to put an airplane together carelessly, is it?

Maj. BRETT. No, sir; it is not.

Senator REED (reading):

Cotter pins have been substituted for buffers.

Do you know about that defect?

Maj. BRETT. I could not say.

Senator REED (reading):

Wing skids badly fitted and ash-packing blocks omitted.

Do you know about that?

Maj. BRETT. No, sir.

Senator REED. The omitting of an ash block and putting in some inferior material would be a serious matter, would it not?

Maj. BRETT. I could not say. Of course, it would depend upon the construction. I was trying to connect that up with the wing skid.

Senator REED. If the wing skids were badly fitted, what would be the effect of that?

Maj. BRETT. In landing; in case the man tipped one wing up and the wing skid gave away it would detach a wheel.

Senator REED. It might kill him or injure him?

Maj. BRETT. The possibilities of his escape are very high.

Senator REED (reading):

Main compression ribs in the main plane are of hollowed-out type with 3-ply web. These should be solid spruce, to prevent flange from bulging up.

Do you know about that defect?

Maj. BRETT. That would be a question for the technical engineer to decide.

Senator REED. As a matter of fact, do you know whether the flange did bulge up and this defect did develop on the trial of the plane?

Maj. BRETT. I have never heard of that.

Senator REED. Do you know whether that occurred or not?

Maj. BRETT. No, sir.

Senator REED. I read again:

No fairing placed between double-fly wire. All these wires should be of stream-line type and not of cable.

Maj. BRETT. That is a defect that existed, and it is a defect that is not vital by any means. It merely cuts down head resistance, and the French very carefully use that type of construction on chasse where the highest speed is obtainable.

Senator REED. It is desirable?

Maj. BRETT. Yes, sir.

Senator REED. But it was desirable to remove that defect?

Maj. BRETT. Yes, sir.

Senator REED (reading:)

Washers under fixing bolts of ailerone pulley wheels omitted, allowing aluminum packing to penetrate into ribs at leading edges.

That is a serious defect, is it not?

Maj. BRETT. I could not say how serious.

Senator REED. Did you learn of that defect?

Maj. BRETT. No, sir; I did not hear of that.

Senator REED. Did you learn of this:

Tail-skid shock absorber wound so tight that skid throws great strain on cross members of fuselage. Rubbish plate for this skid extends only about 6 inches compared with 18 inches extension fitted in England.

Maj. BRETT. I have heard that there was not enough play in the tail skid. It was wound too tight for it to give as it should give.

Senator REED. What might be the effect of that?

Maj. BRETT. It would be the effect that you would get a jerky pull on the craft bar and the leading end of the absorber which would be of an elastic tension.

Senator REED. Would it put an extra strain on the machine?

Maj. BRETT. Yes, sir. It has a tendency to bulge down the member to which the shock absorber is attached.

Senator REED (reading:)

There is one 8-inch play in hinge of tail plane. This fitting should be made snug to take all play away.

Did you know of that defect?

Maj. BRETT. No, sir.

Senator REED. Do you know whether that defect has been remedied?

Maj. BRETT. No, sir; I could not say.

Senator REED (reading):

Cotter and split pins were used in adjustment of tail hinge instead of bolts and nuts.

What about that?

Maj. BRETT. I think that was so. I have heard that statement.

Senator REED. What would be the effect of that? A dangerous construction, is it not?

Maj. BRETT. I should say not.

Senator REED. Not dangerous?

Maj. BRETT. Yes, sir.

Senator REED. What would be the object of changing it?

Maj. BRETT. To give you a greater factor of safety.

Senator REED. That is to say that the bolts and nuts are safer than the devices which were used?

Maj. BRETT. Yes, sir.

Senator REED. If they are safer, then the others must have been more dangerous.

Maj. BRETT. Yes; but of course there are many sides to that on the production proposition. Of course, fitting a nut and bolt with a cotter pin in a split head is a much longer production problem than using a good cotter pin, in the end——

Senator REED. You do not really mean to say that there is any serious problem in production in this country arising out of getting bolts and nuts enough for the tail hinges of the airplanes?

Maj. BRETT. Probably not in actually getting the bolts and nuts, but there is a question of the time it takes to place them both.

Senator REED. You do not mean to say it takes any such length of time to put a nut and bolt as would warrant anybody in reducing the factor of safety of machines?

Maj. BRETT. I do not know. I am not experienced enough to say. It is nothing but a plain strap hinge, and a bolt passes through it, and you slip a cotter pin in to hold that bolt. Where there is practically no end strain on that bolt it seems to me it would be a matter of great argument whether that cotter pin would not serve the purpose as well.

Senator REED. Have we any right to take chances on a thing of that kind when bolts are about as plentiful as leaves on the trees, as well as wrenches?

Maj. BRETT. They are not. I handle all that material in France.

Senator REED. Do you know whether there is a shortage in these factories?

Maj. BRETT. I do not know. That is the reason I came over.

Senator REED. I think there are enough wrenches in this country to remove all the bolts and put on all the nuts.

Maj. BRETT. I think so. I think it is a very debatable question myself. I am not learned enough to give a technical answer.

Senator REED. What about this criticism that "stream line covers were omitted from fin and empennage"?

Maj. BRETT. That is another one of those questions such as the stream line for the cables. It makes considerable difference in the speed of the machine.

Senator REED (reading):

In center section main plane fixing bolts are a very loose fit in spar.

Maj. BRETT. That would be a serious defect.

Senator REED. Do you know how many machines had this defect?

Maj. BRETT. I do not.

Senator REED. That indicates bad construction, does it not?

Maj. BRETT. Yes, sir. It does in a way, except that we have found that those machines are placed in boats where they get affected by salt water after coming from the interior and then they go to the interior and there is a great possibility for drying out.

Senator REED. Does that make the hole larger?

Maj. BRETT. It might have a tendency to, I think. I am not sure. That was discussed in connection with the packing question. They sent several special packers over there to investigate how the machines were coming through after packing in the United States, and it was found on the general average they came through in the most excellent condition, but they could not tell as to the effect of the humidity and the weather on the wooden members of the machine and special care was taken at the inspection center in regard to the inspection problem; officers alone could inspect planes.

Senator REED. Do you think that if a stick of wood was thoroughly seasoned and dried and a hole was bored in it that the weather would make that hole bigger?

Maj. BRETT. I do not know.

Senator REED (reading further):

Wrapping of wire terminals in some cases bad.

Maj. BRETT. Yes, sir.

Senator REED. That is a very dangerous thing, if the wrapping was bad, is it not?

Maj. BRETT. Yes, sir; but that is a thing that is liable to happen.

Senator REED. But it should be avoided?

Maj. BRETT. Yes, sir; it should be tested very carefully.

Senator REED. If good workmanship is employed it would not occur. We would not get bad wrapping from good workmanship?

Maj. BRETT. Practically never.

Senator REED. And you would not get bad wrapping if you had good inspection in the factories?

Maj. BRETT. It would depend upon workmanship because an inspector could not tell except by taking about 10 per cent of the output and inspecting it.

Senator REED. Could not the inspector see this work as it was done?

Maj. BRETT. Yes, sir.

Senator REED. And could they not tell whether it was being properly done?

Maj. BRETT. Yes; by watching it very carefully.

Senator REED. We are talking about something that requires some care when men like yourself are ordered up in the air 10,000 or 20,000 feet and ride around in it, they ought to have whatever care and diligence we can bring to it.

Maj. BRETT. Yes, sir.

Senator REED. Do you know to what extent these wire terminals were bad?

Maj. BRETT. No, sir; except that I heard that they had found grease on the interior of the wire wrapping. That is, in splicing it down with a saw between the two cables, in opening it up they found a semblance of oil there, showing that the terminal had not been allowed to remain in the hot solder long enough to boil the grease out.

Senator REED (reading):

Pilot's wheel on tail planes should be bolted and not secured with lag screws.

Maj. BRETT. It is a wood screw usually varying in length with a very coarse thread and usually a bolt head. It is practically a heavy type of wood screw.

Senator REED. That is a serious defect.

Maj. BRETT. Yes, sir; they should never trust to a lag screw where a man has to depend upon his wheel. They should be bolted.

Senator REED. Did you know of that defect?

Maj. BRETT. I had not heard of it; no, sir.

Senator REED. I read again:

Ashes temporarily have been omitted from axles, which break.

I take it that means a part of ash wood. Did you know of that?

Maj. BRETT. No; sir; I never heard. The axles were very weak.

Senator REED. But you did know that the axles were weak?

Maj. BRETT. Yes, sir; and our people over there put in the axle a piece of oak about 14 or 15 inches long. They inserted it in the axle with the fork coming down like that [illustrating] to take the strain at the fork.

Senator REED. In other words, you took something which was weak and you made it by working on it in the field; you made it so it was all right, or approximately all right?

Maj. BRETT. Yes, sir.

Senator REED (reading):

Air-speed indicator heads are heavy and glassy and this instrument is virtually worse as at present fitted.

Maj. BRETT. That was a very, very poor piece of work. We laughed considerably over that because it looked as if some aluminum manufacturer had gotten a contract to sell pounds and pounds of aluminum. Although it was claimed to have been modeled by an expert in delicate instruments of that type, it seemed to us after handling the Frech air-speed indicators to be a very clumsy instrument.

Senator REED. What did you do about it?

Maj. BRETT. We pulled them off and put on French instruments, as I remember.

Senator REED. I suppose that the air speed indicator is a very important instrument to the aviator?

Maj. BRETT. Yes, sir; that is one of the instruments that he depends upon.

Senator REED. It might cause an accident, especially if he was an aviator who had been trained to regulate his speed not by his eye but by watching the various instruments on the machine?

Maj. BRETT. We never get those.

Senator REED. Not often, but this committee happens to know that there is a class of aviators who teach their students not to rely upon the eye and the sense of speed but to keep close watch of their instruments.

Maj. BRETT. They should be omitted immediately, because flying is the same as riding horseback or playing tennis or running.

Senator REED. There is evidently a difference of opinion, because some very good authorities have claimed—some of them, at least one of them in charge of one of our great flying schools—that the reason so many accidents occur is because the aviator does not follow his instrument but makes a rough guess at it. It is an important instrument, however.

Maj. BRETT. Yes, sir; it is an important instrument.

Senator REED (reading):

Such things as jammed pulley wheels and joints in the landing gear structure show faulty inspections.

Has your attention been called to that?

Maj. BRETT. No, sir; I have not heard them make that complaint.

Senator REED. Did you learn that the Liberty motor was defective and indicated that the shop inspection was not good and that that was especially true of the Packard?

Maj. BRETT. I have heard the fact stated that our first motors were of Packard construction. Our second lot of motor—I can not say exactly how many motors there were in each lot—came from the Cadillac people, as I understand it, and I have heard the man at the production center say that the Cadillac people were keeping up to their usual construction.

Senator REED. You did not hear the Packard work was not satisfactory?

Maj. BRETT. No, sir; I did not. That is the way it was given out; that the Cadillac were keeping up to their usual careful method of construction.

Senator REED. What do you say about this:

Open carburetor inlet not safe.

Maj. BRETT. No, sir; I do not know about that. The only thing I know of is that they, in order to prevent any chance of fire, formed a jacket around the carburetor, practically inclosing it except for the air intake, so that with a drain running down back under the machine so that if any gasoline escaped from the carburetor it would be caught in this jacket and drained down back underneath the machine, so there would be no chance of fire.

Senator REED. In other words, you agree, then, that this open carburetor inlet was not safe, and neither the British nor the French will use them, and that it was imperative to arrange gasoline tightly piped to carburetor and drain it outside fuselage.

Maj. BRETT. I do not know as to that. I only know they spoke of this outside the construction and also of the gas tank.

Senator REED. Did they change these machines so that they had this outside construction?

Maj. BRETT. Yes, sir; I understand they did. They put this outside jacket on, and I understand they were at the same time experimenting with an English jacket to put entirely around it for the same purpose.

Senator REED. What do you know about the performance of the carburetor at altitudes?

Maj. BRETT. The only thing I know of the carburetor is that it got entirely too much gasoline; that Col. Kilmer in his workings with the machine cut his carburation by 50 per cent, so he said to me one Sunday morning.

Senator REED. Did they put on a different carburetor?

Maj. BRETT. No, sir; they were working with the carburetor which was then installed.

Senator REED. What kind of carburetor was used?

Maj. BRETT. I think the Zenith.

Senator REED. The Zenith 52?

Maj. BRETT. I do not know the number.

Senator REED. Do you agree with that, that—

Flight tests in England supervised by Capt. Munford indicate Zenith 52 carburetors not satisfactory and cheaply made but better results from Claudel.

Maj. BRETT. I do not know as to their being cheaply made and unsatisfactory.

Senator REED. Was there some trouble as to the water pipes from the radiator to the pump?

Maj. BRETT. The outlet water pipe running from the radiator to the pump, as I understand, was placed in such a position that to get off the bottom of the oil pump to clean it meant that the entire length of pipe, which is a very cumbersome affair, had to be detached. It was a question of faulty design for the handling of this drain for the oil pump. That is the only thing I ever heard of that lower water pipe.

Senator REED. Did you have some trouble with the oil tanks bursting over there?

Maj. BRETT. Not that I know of.

Senator REED. You did not know then that oil tanks burst in the service because the copper tube vents from the oil tanks were too small?

Maj. BRETT. No, sir; I did not know that.

Senator REED. I call your attention to this:

Copper tube vents for oil tanks should be five-sixteenths of an inch. Oil tanks burst in service because this tube is too small.

What would be the effect of the oil tank pipe bursting?

Maj. BRETT. The motor would be ruined if he did not notice it and attempted to keep on flying.

Senator REED. If a man was some miles back of the German lines he would probably have to light.

Maj. BRETT. Yes, sir.

Senator REED. The engine would heat on him.

Maj. BRETT. Yes, sir.

Senator REED. And that was a serious defect?

Maj. BRETT. Yes, sir.

Senator REED. That was a fault of engineering originally?

Maj. BRETT. Yes, sir.

Senator REED. What do you say to this:

Vent for radiators must have a tube leading water where it can not blow on spark plug or pilot, and vent should not be in radiator caps.

Maj. BRETT. That is correct. That has been rectified.

Senator REED. Was that a troublesome thing?

Maj. BRETT. Yes, sir; in view of the fact that an ordinary mechanic, as most ordinary mechanics will do, will fill the radiator to the top, and as soon as the motor heats up a little the water boils with such power as to force the water over the head and it drips down onto the spark plugs and you would get short circuits.

Senator REED. And when you get short circuits up in the air your motor stops.

Maj. BRETT. And you make forced landing.

Senator REED. And when you say you make a forced landing you may have a fall?

Maj. BRETT. That depends upon the experience of the pilot.

Senator REED. Did you have some trouble with the oil tubes from the tanks to the pumps?

Maj. BRETT. I do not know. I thought I heard something about that. I think a question of vibration came in there as to whether the joints were properly constructed to stand the vibration on the lengths of the coil.

Senator REED. I will call your attention to this statement:

Oil tubes from tanks to pumps must be 1 inch or larger, and plug for draining oil tanks to be 1 inch. The present sizes will not work in cold weather.

Maj. BRETT. That was faulty design. I had not heard of that.

Senator REED. Now, I come to the matter which I think you had in mind a moment ago:

Gasoline tube to carburetors not secure against vibration and hose connections to carburetors not secure against detachment.

That would be a serious matter, would it not?

Maj. BRETT. Yes, sir; very serious.

Senator REED. What was done about that?

Maj. BRETT. I do not know offhand. It was rectified and made absolutely safe.

Senator REED. Are you sure it was made safe or did somebody tell you that he thought all these defects had been rectified?

Maj. BRETT. They had all the experience that they could get behind them over in France and they were scared to death on account of the fire problem because we had lost men in the Nieuport, which is a French machine. They turned over to us a bunch of machines in which the copper tubing had not been properly annealed and before we found out where the fault was we lost several men burned up, and as a result of it they were very careful of the testing of all connections.

Senator REED. You had some trouble over there with the De Havilands?

Maj. BRETT. As I said earlier in the day, we had one man burned very badly because there was no outlet from the gravity tank to take the overflow in case the pump kept on working.

Senator REED. Was there some trouble about these priming tubes and thermometer tubes being in the wrong place?

Maj. BRETT. I could not say.

Senator REED. I read:

Priming tubes and thermometer tubes over manifold should be placed so as to leave carbureters accessible.

Maj. BRETT. That would be a question of design and I did not hear of that.

Senator REED. Was there some question about the oil tubes between cylinders not being secured to the crank case?

Maj. BRETT. I could not say. I do not know.

Senator REED. I read further:

Oil tubes between cylinders should be secured to crank case. Interchanging positions of switches and all high-speed indicators so that switch operates with left hand and close to control lever.

What do you think about that?

Maj. BRETT. That would be for the convenience of the driver, the pilot. Undoubtedly that was on the other side of the board, and a man naturally drives with his left hand and any instrument which he has to change should be in close proximity to his left hand.

Senator REED. Was there some trouble with the control lever?

Maj. BRETT. No, sir; not that I know of.

Senator REED. I read:

Engine control lever and mounting not rigid enough.

You do not know about that?

Maj. BRETT. No, sir; I do not. There was a complaint that there was no control lever on the observer's side. He had a stick called the plane-wing control but not for the engine control.

Senator REED. Did you have some trouble with the battery boxes on account of short circuits?

Maj. BRETT. I could not say.

Senator REED. I read:

Battery boxes does not protect against short circuit.

Do you agree with this that the "present system of main gasoline tank under air pressure should be changed because of danger from fire?"

Maj. BRETT. I could not say.

Senator REED (reading):

And because if penetrated above the liquid level by rifle bullets pressure is lost. Suggest enlarging needle valve on carburetor and altitude adjustments and use of gravity feed tanks in upper wing or pumps between tanks and carburetors. Overflow for gasoline from upper tanks should be conducted to point at least 6 feet from exhaust and visible by pilot.

Do you know whether those suggestions have been carried out in France?

Maj. BRETT. I know that the one in regard to overflow has been carried out.

Senator REED. All of those suggestions could not be carried out in the machine as at present constructed.

Maj. BRETT. I hardly see how they could. The problem of gasoline in all motors is a very serious one that they are testing all the time.

Senator REED. Did you have some trouble over there with the mounts of the guns?

Maj. BRETT. No, sir; I have heard a good deal of complaint on the type of gears used for synchronizing devices and the Pirrell mount, which is a round mount, which fits around the observer and consists of an arc which is movable up and down and the whole thing turns. There is a ratchet-toothed arc running up each side that is clamped together and those arcs were of very poor metal construction, so if the observer leaned his weight on it there was a possibility of that arc bending; not giving away, but it was too soft.

Senator REED. Iron instead of steel?

Maj. BRETT. It did not seem to be iron. It seemed to be a composition of some sort which would bend, crumple, and not crack off.

Senator REED. Did you know about the quadrant scarfs being too light and the gun jumping badly?

Maj. BRETT. I think that is the thing I have just spoken of.

Senator REED. Was there any trouble about the fixed gun mount fastenings being inaccessible and not properly locked?

Maj. BRETT. No, sir; I never heard of that.

Senator REED (reading):

Fixed gun-mount fastenings inaccessible and not properly locked in place. Removal and replacement of fixed gun destroys alignments of barrels. Gun can not be adjusted so that barrels are parallel to line of flight and still permit line of sight to clear radiator.

Did you know about that?

Maj. BRETT. No, sir; I did not.

Senator REED. Isn't it a fact that when a man is up in the air in one of these machines he is liable to have to fight?

Maj. BRETT. Absolutely.

Senator REED. Isn't it a fact that if it is true that the fixed gun-mount fastenings are inaccessible and not properly locked in place and that removal and replacement of the fixed gun destroys alignments of barrels, and if it is true that the gun can not be adjusted so that the barrels are parallel to the line of flight and still permit line of sight to clear radiator, that machine is almost defenseless as far as those two guns are concerned?

Maj. BRETT. Yes, sir.

Senator REED. That is a very serious matter to a gentleman up in the air with a Hun coming after him, is it not?

Maj. BRETT. Yes, sir.

Senator REED. This says those have not been remedied. Have they been remedied?

Maj. BRETT. They must have been, because those planes went to the front.

Senator REED. Oh, yes; but is going to the front conclusive evidence that they went to the front in proper shape?

Maj. BRETT. They would not send them to the front unless they were in condition to use the four guns.

Senator REED. Suppose you were short of equipment and guns and planes?

Maj. BRETT. Those people over there would not do that, because they have a personal interest in the man who flies.

Senator REED. We all have a personal interest in him.

Maj. BRETT. Although I do not know that those guns were rectified, yet I would say—I know the men who are working on those guns

and I can not conceive of their letting those front guns go out with men using them as they are intended to be used.

Senator REED. Is there such a thing as the Aldis ring sight?

Maj. BRETT. Yes, sir.

Senator REED. Do you agree with this, that the—

Aldis ring-sight mountings are inconveniently placed and can not be used by pilots.

Maj. BRETT. I heard a discussion that they were placed so high that the pilot would have to raise up in his seat slightly.

Senator REED. He does, does he not?

Maj. BRETT. I do not know. I never tested it.

Senator REED. What do you call the De Haviland 4—a fighter, a bomber, a reconnaissance plane, or what?

Maj. BRETT. Why, my understanding of it was from conversation that it was to be a combination of an observation and day bomber, which would incorporate its ability to fight.

Senator REED. That is, it is really a defensive fighting machine.

Maj. BRETT. Yes, sir.

Senator REED. It is not to be sent to attack?

Maj. BRETT. No, sir.

Senator REED. It is what you speak of as a scouting plane?

Maj. BRETT. We usually speak of it as a pursuit or chasse.

Senator REED. Do you think it is suitable for a bomber?

Maj. BRETT. It is suitable for a day bomber except that its cruising radius is not sufficient.

Senator REED. That is the point exactly. It is suitable for a day bomber except that its cruising radius is not sufficient. Now, a machine whose cruising radius is not sufficient is not fit for the work that it is not sufficient for.

Senator NEW. Its cruising radius is limited by the quantity of gasoline it carries?

Maj. BRETT. Yes, sir.

Senator REED. If its radius is insufficient, is it sufficient as a day bomber?

Maj. BRETT. It would all depend upon the location in the lines and the type of work they wanted to do. The English do a great deal of bombing just behind the lines on the mobile forces or ground forces.

Senator REED. There you use this type of machine for want of a better one.

Maj. BRETT. Yes, sir. On the other hand, they are building a Handley-Page at the present time with a cruising radius of 1,400 miles to go to Berlin in. That is their one object. And that is the question. I understand it has a two and one-half hour cruising radius.

Senator NEW. According to that cruising radius, 66 gallons at 37 miles to the hour takes 48 minutes to reach 16,800 feet high and allows it a cruising radius of 1 hour and 12 minutes.

Senator REED. Do you agree to that?

Maj. BRETT. I do not know.

Senator REED. You agree that if we could have a better machine with a longer radius than this it would be a desirable thing?

Maj. BRETT. Yes, sir; it would be desirable.

Senator REED. We are using the De Haviland 4 for want of a better machine.

Maj. BRETT. Yes, sir.

Senator REED. England and France do have better machines, do they not?

Maj. BRETT. They have better machines as regards cruising radius; but, whether it is better in other ways, I do not think it is.

Senator REED. You do not undertake to say?

Maj. BRETT. My general opinion, from what I picked up, is that the De Haviland as it stands now for many other purposes and for speed is better than anything they have in France at this time.

Senator REED. What is the ceiling of the De Haviland 4?

Maj. BRETT. I could not say.

Senator REED. What is the speed of the De Haviland?

Maj. BRETT. I had the impression it was around 115 to 120 miles.

Senator REED. What is its climbing rate for minute?

Maj. BRETT. I do not know. I had the impression it was somewhere around 1,000 per minute up to 10,000 feet; something of that sort.

Senator REED. It carries two people?

Maj. BRETT. Yes, sir.

Senator REED. Are there any French or English machines, bombers, where the pilot and the observer are close together, so they can talk to each other?

Maj. BRETT. I do not know. I could not say as to the relative positions of the pilot and observer on the other machines. I was trying to think of the Salnson, which is the French machine they think so much of.

Senator REED. As a matter of fact, we are preparing now to discard the De Haviland 4 and build the De Haviland 9A, I believe; they are going to call it the U. S. 9.

Maj. BRETT. Yes, sir.

Senator REED. And one of the principal changes in the De Haviland 4 is that they put the observer and the pilot in the new machine close together. Did you know of that?

Maj. BRETT. No, sir. I have only been here three days.

Senator NEW. The statement is made by Mr. John D. Ryan, and also by Mr. Nash, the manager of the technical department, that the United States will supplant the De Haviland 4 with another and a better machine just as speedily as that can be done. Let us go back to this question a moment of the ceiling. You say that you do not know what was the ceiling is?

Maj. BRETT. No, sir.

Senator NEW. I do not blame you for that; there are so many reports, but let us assume that Maj. Muhlenberg is right. He is the officer who is in charge of the Wilbur Wright testing field. He says that its ceiling is 15,800 feet and that it carries 75 gallons of gasoline and that its consumption, at full throttle, is 37 gallons per hour, so it carries about two hours' fuel at full throttle. Assume that and assume the time that it takes for the machine to reach its ceiling, and bearing that in mind, I want to ask the question, How far back of the fighting lines do these machines have to go to get their gasoline and supplies?

Maj. BRETT. The observation squadron, in which the De Haviland might be classed, usually run about 10 or 15 kilometers, which is five-eighths of a mile. That would be somewhere around 6 or 10 miles behind the lines.

Senator NEW. Of course, that varies. Sometimes they can not have them so close.

Maj. BRETT. No, sir.

Senator NEW. So that a man must count out of these two hours the time you take to make the ascent, the time to fly to the German lines, and the time to pass over them to your final objective and make your observations and do your bomb dropping, and then the time to get back, not only to your own lines but to your supplies. That is the situation.

Maj. BRETT. Except that they usually climb from the field straight up. They climb as they go toward the lines.

Senator NEW. You agree that is a very serious defect?

Maj. BRETT. Yes, sir; they should have a greater cruising radius.

Senator REED (reading):

The pilot is so situated in between the wings that he can not see the object at the proper time, just before the observer picks it up.

That is, for bombing.

That the pilot should first pick it up, and he should follow it until the observer can pick it up, and the observer should pick it up far enough in advance to set the bomb right at the proper time. As the target comes under the leading edge of the lower wing the pilot loses sight of it and the observer does not pick it up until it is too late to set the sight from the end seat.

If that is the construction of that machine, it is very faulty for a bomber, is it not?

Maj. BRETT. Yes, sir; I should say so, because it seems absolutely imperative that both men should keep the target in view all the time.

Senator REED. You would not say, if this is true, that this machine is a good day bomber?

Maj. BRETT. No, sir; it is not a good bomber.

Senator REED. And you are not prepared to say that that criticism of Maj. Muhlenberg is not correct?

Maj. BRETT. No, sir; I am not.

Senator REED. Have you known anything about the trouble with the fabric covering these wings?

Maj. BRETT. No, sir; I do not.

Senator REED. You say that you did not have any of that trouble in France?

Maj. BRETT. No, sir; I did not say that. I said that I had not heard of it.

Senator REED. If the fabric over the wings of the De Haviland 4's is looser than in the training planes that you have used, it would indicate bad and dangerous construction, would it not?

Maj. BRETT. Yes, sir; the fabric should be stretched as taut as possible without warping the wing members.

Senator REED. I believe you have already stated that you agree that the stabilizer is not fastened to the machine in the proper manner, and that that defect has been partially, or, you think, altogether remedied in France?

Maj. BRETT. Yes, sir; it was remedied as recommended in that cablegram.

Senator REED. Do you know how long it takes a De Haviland to reach its ceiling of 15,800 feet?

Maj. BRETT. No, sir; I do not.

Senator REED. These defects which you say if they are true would affect the De Haviland as bomber would affect it even more seriously as a fighter, would they not?

Maj. BRETT. I said a combination observation and fighter. That is, it is not an ideal fighter. A bomber can not be an ideal fighter.

Senator REED. But if it had these defects for bombing purposes which I have just been calling your attention to, those defects would count more against it as a fighter than as a bomber?

Maj. BRETT. No, sir; I do not think so.

Senator REED. You do not agree with Maj. Muhlenberg. I will read the question and answer:

Senator NEW. You have spoken of some of the defects which, in some measure, disqualify the De Haviland 4 as a bombing plane. Do you know of any defects which tend to disqualify it as a fighter?

Maj. MUHLENBERG. I believe those that disqualify it as a fighter are really more serious than those that disqualify it as a bomber. The location of the pilot seat is immeasurably bad.

Senator NEW. That is, the De Haviland 4?

Maj. MUHLENBERG. Yes, sir. I see from the French report we have on the De Haviland that the English De Haviland had a pilot seat in approximately the same place; that is, between the wings and very far in front of the observer's seat. That is unquestionably wrong. I have never sat in a machine in which a pilot could see less than in the De Haviland 4. I have sat in the United States D. 9, as it is called, which is an alteration of the D. H. 9.

Maj. BRETT. Well, I could not positively make a statement on that. That is my idea of the fighter. In that case it would be a fighter, but would fight as a bomber.

Senator REED. That is what I am trying to get at. If this machine had the defects, which I have called your attention to, as a bomber—that is, these short ribs, these defects of construction, and this defect in regard to the machine guns, so that a man could not sight—would not all those defects count against it as a fighter of the character it is intended to be?

Maj. BRETT. Absolutely; they would count against it on that basis.

Senator REED. Assuming now that they are getting out a De Haviland 9, or a U. S. 9, that they strengthen the machines in these parts which have been indicated, that they give it a greater radius of action, that they put the pilot and the observer close together, and that it operates successfully, would you then agree with Maj. Muhlenberg that the De Haviland ought to be withdrawn?

Maj. BRETT. I do not think it should be withdrawn until they have something in production.

Senator REED. I say as soon as they can get something better in production.

Maj. BRETT. Absolutely. If they have a better machine they should give it to us, but I do not think it should be withdrawn until they actually start delivering the new machine.

Senator REED. Do you know anything about the attempt that is being made in this country to produce an entirely new machine in place of the De Haviland 4?

Maj. BRETT. No, sir.

Senator REED. Do you know anything about the Le Pere machine?

Maj. BRETT. No, sir.

Senator NEW. It would hardly be fair to ask you if you agree with this statement in answer to a question by Senator Reed:

What suggestions have you to make with reference to a way out of these difficulties?

Maj. MÜHLENBERG. The relegation of the D. H. 4 to use as a reconnoissance machine solely, the speeding up of the production of the Le Pere machine, and the adoption of that, probably, as a fighter, and the development of the U. S. D. 9 to the point where it can be used as a day bomber.

Maj. BRETT. I have never heard of the Le Pere machine.

Senator NEW. I want to call your attention to the statement of Capt. Kelley. Do you know Capt. John Hubert Kelley?

Maj. BRETT. No, sir; I do not believe I do.

Senator NEW. Capt. Kelley, of the Signal Corps, is at present in charge of what is called the fighter flight, including the De Havilland 4's, and the testing department at Wilbur Wright Field. He has been in the aviation service since 1915.

Maj. BRETT. Did he just come from France?

Senator NEW. Yes.

Maj. BRETT. Yes, sir; I knew him.

Senator NEW. He has the reputation of being a fighter and a good aviator.

Maj. BRETT. Yes, sir; and he also has the reputation of being very intelligent. He used his head and he used his brains.

Senator REED. He said this, in answer to this question by myself:

Senator REED. What opportunity have you had to judge the De Havilland as built in this country, and how does it compare with the British machine of the same type?

Capt. KELLEY. The answer to the first part of that is: I arrived for duty July 15 at Wilbur Wright Field and inspected for my satisfaction the American-built De Havilland 4's. After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion, the machine is not safe to fly. I mean to say, it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

Did you ever have the opportunity to take these machines apart and examine them in the same way that Capt. Kelley did?

Maj. BRETT. No, sir; I never had.

Senator REED. I call your attention to one other thing. This is a statement by Capt. Kelley:

The way they make them over here, or the way the American-made De Havilland 4—in the first place, the fabric, whether it is the paint which is put on after it is doped—but every fabric that I tested on a wing would not be allowed to be flown, as far as I am concerned. I would condemn it because it is dead. The fabric must sound like a drum. If it leaves an impression of your finger when you put your finger on it and slowly comes back again, that fabric would be condemned and taken out and new fabric put on until it stretched tight.

Do you agree to that?

Maj. BRETT. Yes, sir.

Senator REED. That is absolutely essential and the most important part of the flying machine. Is that true?

Maj. BRETT. Yes, sir.

Senator REED. Did you have any trouble with the fabric over there?

Maj. BRETT. I do not know. I never heard a complaint of the fabric. I mean, that is a small thing that can be rectified very readily, and they might have had trouble which they went right ahead and changed without calling attention to it.

Senator REED. I believe you never flew in a De Haviland except once or twice as a passenger.

Maj. BRETT. Yes, sir; as a passenger.

Senator REED. You never examined it in reference to the fighting of a machine gun, did you?

Maj. BRETT. No, sir.

Senator REED. If this is true, what would you say about it:

The guns, as at present mounted for the pilot, are absolutely inaccessible. The sights placed on one side, of course, is absurd. In other words, in pointing the machine—which is the only way the pilot can sight his gun—the pilot has to lean over this way [indicating], and when you have a bead on your enemy's machine you have to sit still. If you lean to one side to sight your gun you automatically would move your hand on your control, and that would throw you out of line on the machine you are aiming at. In the position your guns are at it would be impossible to clear any jams that may occur without standing up on the seat—any jam in the mechanism of the gun itself or in the cartridges.

Maj. BRETT. I do not know. If that is a defect, why, it absolutely throws the pilot out of the fighting class.

Senator REED. If a man like Capt. Kelley, who has had experience as a fighter, should say that—if you had not examined it yourself—you would be inclined to accept his judgment?

Maj. BRETT. I would like to make a statement on that first statement of Capt. Kelley in regard to poor construction. I heard Capt. Burton, in Paris, make the statement that Capt. De Haviland, the officer who designed this machine, and Capt. Shonks, had taken one of our De Haviland 4's and had stripped the covering entirely off of it and had examined it, and that their report was exceptionally favorable. In fact, as I remember the report, it stated that the machine was better constructed for a small machine——

Senator REED. Was that an official report, or did Capt. Burton tell you that somebody had told him?

Maj. BRETT. He is in England at this time.

Senator REED. Did Capt. Burton tell you that he had heard this statement made, or did you hear it made yourself?

Maj. BRETT. No, sir; it is a hearsay statement. Capt. Burton did not say that he had heard the statement made, but that the report was made.

Senator REED. Do you think that if these defects are in this machine, which I have called your attention to from Gen. Pershing's report, that it is possible that Mr. De Haviland, of England, ever said that that work was better work than he had ever put in his machine?

Maj. BRETT. That is the way I heard it.

Senator REED. Don't you think there is some mistake about that? You do not think the English have turned out that kind of work?

Maj. BRETT. He was speaking of the general construction of the machine. The way that the general work is placed in the machine.

Senator REED. Speaking of the general construction, I read:

In your opinion, are we sufficiently careful?

That means in construction.

Would not a large number of these defects which you have spoken of be eliminated if we used more care and time and were not so keen to produce great quantities of airplanes?

Capt. KELLEY. My experience with American mechanics is that they are in too great a hurry to finish whatever job they are on instead of trying to make that job as perfect as they could make it if they take more time.

Senator REED. In other words, the thing we have struggled for largely in this country is quantity more than absolute accuracy?

Capt. KELLEY. The airplane is practically a hand-made machine. Certain parts of it can be turned out by machinery, but the greatest care and exactness must be used in the selection not only of the material, but the way in which the work is carried on and in the final assembly. I can put it this way: This is a phrase that I used to use in talking to mechanics, "An airplane, in my judgment, every time it is wheeled out of its shed to go in the air must be in the same condition that a race-car driver expects of his machine on any big race that he enters."

Would you want us to understand from what you have said about what Mr. De Haviland, the English inventor of this machine, has said, that the workmanship in these American planes is superior to his?

Maj. BRETT. That is the way I understood it; yes, sir.

Senator REED. Did you observe in the planes that you had over there that the fabric in the wings was apparently dead?

Maj. BRETT. No, sir; I did not. That is, the only thing I could say on that was that I have been through our spare-part depot, which is under my control, and I noticed rows and rows of wings in there: I just touched them and they seemed to be all right.

Senator REED. But you did not make any close inspection?

Maj. BRETT. No, sir. Of course, you understand that you can go out before sunrise in the morning and the fabric on the airplane will be dead, but if you go out as soon as the sun comes up, the fabric will be as taut as a drumhead.

Senator REED. When it is properly covered?

Maj. BRETT. I have seen ideal French fabric placed on the best types of airplanes ready to go to the front, and if you caught their fabric before sunrise the fabric would give very readily to the pressure of the hand, and after sunrise the fabric would be as tight as a drumhead.

Senator NEW. Capt. Johnson testified as to the looseness of the fabric in the wing structure. He went over there in 1914 as an ambulance driver and in a few months enlisted in the French Army and was with the French until we went over when he obtained a transfer to the American forces and was with them until about the 1st of July when he came back to this country as an inspector on machines being made at the Dayton-Wright field. Do you not suppose that he would know of that fact after the experience that he had had, to which I have referred, and do you suppose that he would have made this sort of criticism without having that in mind?

Maj. BRETT. I merely brought that out. It is not with the idea that he was incorrect, because if you take a plane which is setting out in the open under the conditions under which you would operate, if your fabric is then loose there is something distinctly wrong with the way that fabric was put on or cured, but I merely brought the idea out that the fabric does loosen.

Senator REED. We spoke a while ago about the holes for the bolts being too large and there was some question about whether that was caused by the moisture, the changes in humidity between here and France. Perhaps this would furnish you with an explanation, because Capt. Johnson when testifying about machines in this country said:

I have observed the fittings in the spars under the fuselage. In the machines in which I saw the wings taken out, the holes which held the bolts in the wood-work were calked, and the bolts themselves were bent. The enlargement of the holes was due to the fact that there was no bushing put in the holes and the enlargement of the holes was caused by vibration.

Would that not be the fact?

Maj. BRETT. Yes, sir; and also due to the fact that the bushing was left out.

Senator REED. And that would be a mistake and would be dangerous?

Maj. BRETT. Yes, sir. It would lower the factor of safety.

Senator REED. What do you say about the splicing of the cables on the machines. Is not that very defective?

Maj. BRETT. There is an opinion in France that a long cable should never be soldered or never jacketed; it should always be spliced. The spliced cable is the strongest cable and the ideal way of making an eyelet for a cable and wrapping or jacketing of a cable is used on account of the production proposition and when you are in a hurry to get a thing done, although improperly done it is very strong.

Senator REED. I want to call your attention to some statements of Maj. Reinhart. Did you have any trouble with the radiators over there?

Maj. BRETT. On that one point of boiling over.

Senator REED. Did you have any trouble about their leaking?

Maj. BRETT. Not that I know of.

Senator REED. I call your attention to the experience that Maj. Reinhart had:

On the first eight machines the radiators sprung leaks and went out of commission after the first two hours of flight.

Maj. BRETT. I do not know as to that.

Senator REED. Do you know whether if they had any such defect it has been remedied over there?

Maj. BRETT. I do not know. I never heard that defect mentioned.

Senator REED. Suppose that happened to a machine; that it "broke while being lined up on a concrete floor in a hangar from its weight." That would be pretty bad.

Maj. BRETT. Yes, sir.

Senator REED. Are these machines nose-heavy with the Liberty engines in them?

Maj. BRETT. I have never heard that complaint. I do not remember of hearing anything about that. I think it was stated that they were a little nose-heavy without the observer; that the observer was used as an equalizer for them.

Senator REED. Did you have anything like this over there?

Two machines nosed over in attempting to get them out of the airdrome. The landing gears were then examined, and it was found that the little braces over the axle or trunion, around which is wound the shock absorber, were

hollow and of very thin metal construction, and on examining different machines it was found the thickness of these trunions was variable, so on some it was bigger than on others so this trunion had to be reinforced before the machines were safe to fly.

Maj. BRETT. No, sir; I never heard of it.

Senator REED. I believe you have already stated that you did observe that the stabilizer was not fastened securely to the fuselage.

Maj. BRETT. No, sir; you asked me if there was, and I said if there was I judged they would take that play up.

Senator REED. I will ask you if you observed that the stabilizer was not fastened securely to the fuselage?

Maj. BRETT. No, sir; I do not know about that. The tail stabilizer is supposed to lower and raise and I think there was a possibility that we had to put in an extra piece where it rested at the end of the fuselage. Whether it was for stream-line purposes or strength, I do not know.

Senator REED. As you only rode in two or three of these machines and were not there for the purpose of inspecting the machine itself, it may not be fair to ask this question, but I ask it for such answer as you think proper. Whether or not you observed such conditions as these—I am again reading from Maj. Reinhart's testimony testifying in reference to these eight machines:

After a very few hours' flight—six hours' average—on these eight machines I personally examined these eight machines and found that the canvas had come loose from the wing structure, the ribs, and spars, and wing beams. I first noticed this by its flapping on the ship while it was in flight, and in examining other machines afterwards I found that the canvas near the fuselage on the bottom of the lower wings had come loose and sagged out from 1 to 3 inches. The canvas on the supper wings near the center section had also come loose on the balance and sagged out to the same extent. On all ships—there were about five of these eight we found in this condition and they were put out of commission until the canvass could be replaced on the wings by our repair shop.

Maj. BRETT. I have not heard of it.

Senator REED. You would not want to say that it did not occur over in France?

Maj. BRETT. Oh, no; of course not. I would not know. That thing might occur and they would repair it without any mention being made of it.

Senator REED. If it did occur, it might be a very serious thing to a gentleman up in the air.

Maj. BRETT. It is possible.

Senator REED. That is what happend to the poor fellows who were killed in the Bristol, was it not?

Maj. BRETT. I do not know about that.

Senator REED. Do you know whether the solder on the wires gave way over there in France?

Maj. BRETT. I know that the eyelets slipped, as we call it. We have two strands coming down this way [illustrating] and a strand slips, and I hape seen the actual eyelets where they have slipped in two or three cases.

Senator REED. That is to say, you have a wire cable or a steel rod which is essential to the support of some part of the machine.

Maj. BRETT. Yes, sir.

Senator REED. And at the end of that the method of fastening it make a loop of the wire cable, drawing it together upon itself, and

the method in France and England is to splice the cable at that point together.

Maj. BRETT. Yes, sir; in most of them.

Senator REED. But, in this country, in the De Havilands at least, we have been adopting the method of soldering these strands together, and we have found that they give way or pull and stretch.

Maj. BRETT. Yes, in certain instances.

Senator REED. Do you believe that any machine is safely constructed that has the main support of the fuselage, and by that I mean the long pieces that run lengthwise with the fuselage that are about an inch and a quarter or an inch and a half square—I am referring to the longerons—where the longerons are bored through as many as 8 to 10 times in 10 inches and bolts inserted. Do you believe that is safe construction?

Maj. BRETT. I could not say. My common sense would say no.

Senator REED. Do you know that that is the construction of the De Haviland?

Maj. BRETT. No, sir; I do not.

Senator REED. Did you ever take one of these machines to pieces and take the canvas off of it and look at the internal structure?

Maj. BRETT. No, sir.

Senator REED. Of course, if you had done that you might have discovered features or elements of strength or weakness in the machine which are covered up by the fabric. [Senator Reed hands the witness a photograph of the De Haviland machine in which the longeron broke because of the excessive number of bolt holes.]

Maj. BRETT. That does not look as if it was good common-sense construction.

Senator REED. And you would not care under these conditions to order anybody up on the battle front in a De Haviland 4 until you had remedied the defects that we have been going over to-day, would you?

Maj. BRETT. All of those defects, I do not know; but I feel, knowing the men who are working on them——

Senator REED. I am asking you to put yourself on your own responsibility and judgment and not on what somebody else is doing, but on your own responsibility; until the principal of these defects or the chief of them is remedied, you would not feel like sending young men up to battle unless you are forced to send them?

Maj. BRETT. No, sir; not unless those defects were cleared up which you may have shown me there.

Senator REED. You became pretty well acquainted with the character of the machines which our flyers were using on the front, our machines which had just arrived?

Maj. BRETT. I did not become acquainted with them from personal contact; no, sir.

Senator REED. By the way, the De Haviland 4's you stated were arriving, so that there were enough to equip a certain number of squadrons?

Maj. BRETT. Three squadrons, with 18 to a squadron.

Senator REED. When those three squadrons were sent, that was the first practical use of the De Haviland which was contemplated?

Maj. BRETT. Yes, sir.

Senator REED. Up to that time no De Haviland had been on the fighting front?

Maj. BRETT. No, sir.

Senator REED. And whether those De Havilands have been put into battle or not, you do not know?

Maj. BRETT. I do not.

Senator REED. And that was on the 30th day of July?

Maj. BRETT. Yes, sir.

Senator REED. I will now return to my other question. You said that you did not have any very ample opportunity to observe the kind of machines—that is, the make of machines—that our men were using before the De Haviland arrived and which they must still be using in large quantities?

Maj. BRETT. Yes, sir.

Senator REED. You can state what you learned in reference to the kind of machines our men were using.

Maj. BRETT. They were using the Spad and the Nieuport, English chasse machines; the Salmsons for observation work and the Breguets for night bombing.

Senator REED. Do you know about how many Spads we have in use?

Maj. BRETT. No, sir. I have those figures over in my papers that I brought back from France with me.

Senator REED. You would not object to looking at those figures and giving us the number of Spads and the number of Nieuports and the number of Salmsons and the number of Breguets, and let us have them to-morrow some time?

Maj. BRETT. Yes, sir.

(Subsequently Maj. Brett submitted the following memorandum, which is here printed in full, as follows:)

AMERICAN EXPEDITIONARY FORCES,
AIR SERVICE, SUPPLY SECTION,
AIRPLANE AND MOTOR DIVISION,
August 1, 1918.

Memorandum to Maj. Brett.

1. The following list shows the approximate number of airplanes received from European sources to July 31, 1918:

School planes:

Breguet 14E2	55
Nieuport 17	75
Nieuport 21	193
Nieuport 23	47
Nieuport 24	77
Nieuport 24bis	112
Nieuport 27 (Rhone 80)	75
Nieuport 27 (Rhone 120)	183
Nieuport 80	146
Nieuport 81	140
Nieuport 83	211
Caudron G3	162
Caudron G4	10
Farman F. 40	8
Morane XXX	5
Rouleurs R. 2	104
Voisin 8	8
Avro (English)	6

1,617

Combat planes:

A. R. 1	21
A. R. 2	89
Breguet 14A2	63
Breguet 14B2	30
Nieuport 28	197
Salmson 2A2	267
Sopwith A2	237
Sopwith B2	97
Spad VII	59
Spad XI	34
Spad XIII	324
Spad XII (cannon)	1
Sopwith Camels (English)	45
Sia (Italian)	47
Caproni (Italian)	1
	<hr/> 1,512
Grand total of all types	<hr/> 3,129

By authority of Capt. Satterfield:

M. B. MOORE,
First Lieutenant, A. S., S. R. C.

Senator REED: The Spad is a single-seater fighter?

Maj. BRETT. Yes, sir.

Senator REED. And so is the Nieuport, is it not?

Maj. BRETT. Yes, sir.

Senator REED. Is the Nieuport an up-to-date machine?

Maj. BRETT. The Spad is considered by people who seem to use it—there is a great difference of opinion on it, but there seems to be a tendency to go to the Spad.

Senator REED. And we use Nieuports because we can not get enough Spads?

Maj. BRETT. They are being converted to the Spads as fast as they can.

Senator REED. The Nieuports we got from France were a class of Nieuports that the French had practically discarded. That is the truth, is it not?

Maj. BRETT. I do not think that. Somebody asked me that question before to-day, if we were not taking discarded French airplanes, and I do not think that we are. I do not order those. But the French Government and our Government are working very close, hand in hand, and as I understand it some French contracts which we have, we get a certain percentage of the output. If the output is 50 machines a day we get 10 per cent. We go in and take 5 of any of those machines.

Senator REED. You do not mean to say that we get 10. You are illustrating?

Maj. BRETT. Yes, sir. That is an illustration. In other words, when the Nieuports come along we get our percentage. They must use those Nieuports on their own front, because our percentage is very small.

Senator REED. You are sure that we do not get some machines of a class that they are no longer producing?

Maj. BRETT. I think not.

Senator REED. Do you know of any way by which that fact can be absolutely ascertained within the next few days?

Maj. BRETT. No, sir; I do not. I know that on the inspection problem we are much superior to the French. That those machines come

out and we will throw back, I would say, 50 per cent of the machines offered to us, and yet they take those machines which we reject and put them into their own service.

Senator REED. What do they do with them first?

Maj. BRETT. They do not do anything. They have been passed by their own inspectors and rejected by our inspectors.

Senator REED. Are you sure of that?

Maj. BRETT. I have heard a big argument about it. The French Government was complaining of the fact that we were turning down so many machines which had passed their inspectors.

Senator REED. About the Salmson machine, which is an observation machine, is that a French or English machine?

Maj. BRETT. It is French. It is called Salmson because that is the name of the motor which is in it.

Senator REED. Is that machine an up-to-date machine?

Maj. BRETT. I think it is right up to date.

Senator REED. Have we as many of the Spads or Nieuports as we need over there?

Maj. BRETT. I think that we have now more machines than we have personnel or material to keep them up.

Senator REED. In France?

Maj. BRETT. Yes, sir.

Senator REED. Why is it, then, that we are so anxious to get other planes over there?

Maj. BRETT. We have plenty of chasse machines, Nieuports and Spads.

Senator REED. Have we plenty of machines, speaking generally, of all classes?

Maj. BRETT. No, sir.

Senator REED. What are we short in?

Maj. BRETT. In observation, day bombers, night bombers, and night reconnoissance and observation. That is, an observation is really a reconnoissance machine.

Senator REED. We are short in the sense that we can not get enough Spads and have to take Nieuports. You say that the Spad is supplanting the Nieuport.

Maj. BRETT. Yes, sir.

Senator REED. But we are short in every other type of machine.

Maj. BRETT. Yes, sir.

Senator REED. How many squadrons have we that are equipped with chasse machines—that is, squadrons that are to use the fighting machines?

Maj. BRETT. I have those figures and I will give them to you tomorrow.

(Subsequently Maj. Brett submitted the following memorandum which is here printed in full as follows:)

AMERICAN EXPEDITIONARY FORCES,
AIR SERVICE, SUPPLY SECTION,
AIRPLANE AND MOTOR DIVISION,
July 30, 1918.

Memorandum to Maj. Brett.

1. Replying to your request for information as to squadrons in operation, we now have operating on the front the following:

6 squadrons, Salmsons.

8 squadrons, Spad, type 13.

- 1 squadron, Spad, type 7.
- 1 squadron, D. H. 4.
- 1 squadron, Nieuport 28.
- 1 squadron, Breguet day bombers.
- 1 flight night reconnaissance, ARS.

2. We shall deliver:

- During the month of August—
 - 17 observation squadrons.
 - 8 pursuit squadrons.
- During the month of September—
 - 20 observation squadrons.
 - 7 pursuit squadrons.
- During the month of October—
 - 15 observation squadrons.
 - 8 pursuit squadrons.

3. In addition to the above, there will probably be delivered D. H. 4 day bombing squadrons, numbers unknown, owing to the experimental work which is still being carried on.

JOHN M. SATTERFIELD,
Captain, A. S., S. C.

Senator REED. I will ask you at the same time, Major, that you give us those figures, to be so kind as to give us, if you have the data, the number of machines with the French and English Army per 10,000 men or 1,000 men, or some other unit, so that I can compare the number of our machines with the number of our troops and lay that alongside of similar conditions in France and England.

Maj. BRETT. I can not give you that. I have not got it.

Senator NEW. Major, Gen. Kenly told us when he was here as a witness that we had been unable to get from the French the number of machines that we had expected to get from them and had really contracted for, because we had failed to keep our contract with the French in the delivery of materials. Do you know anything about that?

Maj. BRETT. Well, one of the departments in my division handles what we call the J. G. White contract. There was a contract written some time over a year ago whereby the United States Government would deliver to the French Government certain raw materials for completed projects. The present status of that contract is that about 75 per cent of it has been delivered and that, due to the fact that the French have not lived up to their side of it—that is, in other words, they have not given us the equivalent value of airplanes or completed finished product—I am personally holding in my depots lumber and steel and forgings which belong to the French Government because they have not delivered what the higher authorities considered a just quantity. I have quantities of that material in my depots at the present time.

Senator REED. Was that the only contract that you know of in which we failed to make deliveries?

Maj. BRETT. We did not fail. There was a transfer.

Senator REED. Well, in which there has been a failure or refusal.

Maj. BRETT. Yes, sir; that is the only one I know of. That is the J. G. White, and from our standpoint over there the French have not delivered and we are holding the material as a knife over their head to try and make them deliver completed material.

Senator REED. There has been a difference of opinion at all events, whatever the cause and wherever the fault lies, between the French and the American organizations, as the result of which there has been

a failure or refusal on the part of the French to deliver the number of planes we had expected to obtain from them for our use. Is that the case?

Maj. BRETT. That is about the way I should say it; yes, sir.

Senator REED. You say it was on the 30th of July that Maj. Dunwoody reported to you that those three——

Maj. BRETT. He told me that he had completed his promise of three squadrons. He had promised two squadrons and he had sent up an additional squadron.

Senator REED. So that three squadrons had been furnished on the 30th day of July?

Maj. BRETT. Yes, sir.

Senator REED. Which had not yet been flown, as far as you know?

Maj. BRETT. Which had not flown in fighting on the front.

Senator REED. That is what I meant, in combat.

Maj. BRETT. Yes, sir.

Senator NEW. I happen to have a letter this morning dated July 30 and written by an officer of some prominence over there with whom I have been long acquainted. He is on the front and he writes as follows. I quote a paragraph from his letter:

Knowing your interest in the work of the air service I know it will be of interest to you for me to tell you a little experience that I had which shows the great need of many fast planes being sent over here. Three boche planes came down over my P. C., which is an abandoned, destroyed farmhouse kitchen, and came down so low that I could see the drivers' faces, and not only dropped signal rockets to direct the fire of their guns on this point but had the nerve to machine-gun us, and then, when we got under the roof, they dropped bombs. We did not have enough planes to drive the enemy off at that time. After he had repeated this a few times we were eventually saved by having some British gun tanks drive up and put up a barrage. In desperation some of our officers fired their pistols at the aviators, which shows how ridiculous it all is.

It looks as though we needed all the airplanes we can get over there. does it not, Major?

Maj. BRETT. Yes, sir, we have four squadrons over there which, from official reports, average about one American to every eight boche. Of course, the French fly about an hour and a half a day and the English fly anywhere from two to two and a half hours a day, and our men fly from four to six hours a day.

Senator REED. Because we do not have the machines?

Maj. BRETT. We have not got the organization to put them up. but the French and the English are both dropping off, not only in the airplane service but in everything.

Senator REED. What do you mean by that?

Maj. BRETT. I mean that they are turning, as fast as they can, everything over to the Americans. Our men will take the work and, therefore, they let them have it. I was in Chateau Thierry five days after the Kaiser was there. I asked my officers how they were coming on and they said, "We have not any airplanes here," and I said, "How do you know we have not?" and they said, "We do not see any stars." And I said "We do not carry stars. We carry a red, white, and blue circle with a white center."

Senator REED. Who said that?

Maj. BRETT. A couple of Infantry officers who had just come off the front.

Senator REED. Do you want to say or not that we have enough airplanes over there now?

Maj. BRETT. No, sir.

Senator REED. We are away short?

Maj. BRETT. Away short.

Senator REED. Short of fighters and everything?

Maj. BRETT. Yes, sir; there is no question about that.

Senator REED. And our men stay up four or five hours as against the French one and a half hours, because their men have more machines and men?

Maj. BRETT. No, sir; they do not cover a bigger sector than we do. They simply will not fly if it is misty or rainy or the weather conditions are not good. Our men will fly in anything and they will fly 10 hours a day.

Senator REED. Men like that ought to have something good to fly in.

Maj. BRETT. Each unit on the fighting line is well enough equipped but we have not enough units.

Senator REED. But you have enough flyers over there to go on the front?

Maj. BRETT. Yes, sir.

Senator REED. You have not enough machines?

Maj. BRETT. We are getting those all the time. The chasse pilot is a very highly trained organization.

Senator REED. But you have more men than machines?

Maj. BRETT. No; not exactly.

Senator REED. Did I not understand you to say that we needed chasse machines?

Maj. BRETT. I heard a scrap going on in the office about a week before I left due to the fact that a certain number of chasse pilots were requested to take machines from one place to another, and he said that there was a shortage of pilots and, therefore, he should do nothing for them.

Senator REED. Do I understand that the complaint that flyers have been kept over there nearly a year without work and with all this controversy we have had regarding more and still more planes that actually now we have not got more flyers than planes?

Maj. BRETT. I could not say. I do not know.

Senator REED. Major, we are very much obliged to you for your testimony.

(Whereupon, at 4.45 o'clock p. m., the subcommittee adjourned.)

During the hearings Senator Frelinghuysen submitted to the subcommittee a statement showing the status of program contracts which is here printed in full, as follows:)

AIRCRAFT PRODUCTION.

EXHIBIT A.
Statement showing status of program contracts for airplanes, engines, and spare parts, May 25, 1918, for cities of Buffalo, Detroit, Dayton, Indianapolis, and Cleveland.

Date.	Order No.	Contractor.	Quantity.	Description.	Unit price.	Total value.		Scheduled date for beginning delivery.	Date delivery commenced.	Number delivered to May 25, 1918.	Per cent completed as of May 25, 1918.
						Cost plus.	Fixed price.				
June 30, 1917	8435	BUFFALO. PLANES. Curtiss Aeroplane & Motors Corporation.	600	JN4D, with engines...	\$8,000.00		\$4,800,000.00		Sept. 29, 1917	600	100
Sept. 15, 1917	20001	do.	1,400	JN4D	4,750.00		6,650,000.00		Dec. 1, 1917	1,400	100
Jan. 5, 1918	20431	do.	600	do.	4,750.00		2,850,000.00		Jan. 26, 1918	501	83 1/2
Apr. 30, 1918	21036	do.	700	do.	4,750.00		3,325,000.00		No delivery.		
Jan. 10, 1918	20387	do.	2,000	Bristol Fighters.					Apr. 23, 1918	11	1
Apr. 13, 1918	20954	Wire Wheel Corporation.	500	Sets of wheels with rims for Handley-Paige.			48,000.00		No delivery.		
		SPARE PARTS.									
Nov. 9, 1917	20215	Curtiss Aeroplane & Motors Corporation.	1,000	Spares for JN4D	Various.		831,435.00		Dec. 1, 1917		72
Aug. 15, 1917	9479	do.	26	Odd lot parts JN4D	do.		2,700.00		No delivery.		
	9745	do.	26	do.	do.				do.		
Oct. 30, 1917	20175	do.	708	do.	Various.	154,580.00		With order 20886.	Dec. 1, 1917		100
Mar. 4, 1918	20708	do.	150	Odd lot parts JN4D, landing gears.	300.00		45,000.00	Soon as possible.	Mar. 15, 1918		100
Jan. 7, 1918	20400	do.	510	Odd lot parts JN4H			39,810.00	do.	Mar. 11, 1918		90
Apr. 30, 1918	21037	do.	879	Parts JN4H		175,000.00			No delivery.		
Apr. 3, 1918	20907	do.	1,200	Parts for Bristol Fighters.		15,690,100.00			do.		
Feb. 19, 1918	20862	Wire Wheel Corporation.	500	Parts for JN4D	9.50		4,750.00	Feb. 26, 1918.	do.		
		DETROIT. PLANES.									
ar. 29, 1918	20207A	Fisher Body Corporation.	400 4,000 400	SJ1 DeHaviland 4 J1 planes		134,000,000.00		1400 SJ1 December, 1917. First 2,000 D. H. 4's completed by Oct. 1, 1918.	Jan. 15, 1918 No delivery.	400	100

Oct. 11, 1917	10138	Engines.	Packard Motor Car Co.	6,000	U. S. 12 Liberty.....	1 42,000,300.00	.....	November, 1917....	Dec. 8, 1917	899	15
Do.	10139		Linco'n Motors Co..	6,000	.....do.....	1 42,000,300.00	.....	.....do.....	Mar. 26, 1918	211	34
Dec. 4, 1917	30035A		Ford Motor Co.....	5,000	.....do.....	1 35,000,250.00	.....	April, 1918.....	No delivery..	.....	.....
Dec. 13, 1917	30071		General Motors Co..	1,000	.....do.....	1 7,700,065.00	.....	May, 1918.....	.....do.....	.....	.....
Mar. 29, 1918	30071-2		.....do.....	1,000	.....do.....	1 6,750,000.00	.....	September, 1918...	.....do.....	.....	.....
			SPARE PARTS.								
Oct. 31, 1917	20207-1		Fisher Body Corporation.	60	Odd parts SJ1.....	.....	7,500.00	Immediately.....	.....	60	100
Nov. 15, 1917	20207-2		.....do.....	150	.....do.....	1 7,500.00	.....	Prior to Mar. 1, 1918.	.....	160	100
Mar. 13, 1918	20207-3		.....do.....	30	.....do.....	1 3,000.00	.....	Immediately.....	.....	30	100
Do.....	10138-4		Packard Motor Car Co.	6,000	Spare parts for Liberty motors.	1 6,000,000.00	.....	Soon as possible...	.....	.....	.....
Jan. 24, 1918	27		Ford Motor Co.....	400,000	Cylinders.....	.....	3,300,000.00	.....	.....	.....	.....
Mar. 7, 1918	10139-3		Lincoln Motors Co..	6,000	Spare parts for engines.	1 6,000,000.00	.....	Soon as possible...	.....	.....	.....
Apr. 1, 1918	30071-3		General Motors Co..	2,000	.....do.....	1 2,000,000.00	.....	With engines.....	.....	.....	.....
			DAYTON.								
			PLANES.								
Mar. 29, 1918	20038A		{ Dayton-Wright Airplane Co.	{ 4,000 400	De Havilland 4's.....	1 233,783,500.00	.....	{ First 1,000 D. H. 4's completed by Aug. 1, 1918. 400 SJ1 December, 1917.	Dec. 22, 1917	155	4
			SPARE PARTS.								
Mar. 29, 1918	20038A		{ Dayton-Wright Airplane Co.	{ 400 3,266	Spare parts for SJ1.....	(*)	.....	.....	Feb. 4, 1918	.....	94
Apr. 23, 1918	20038A1		.....do.....	250	Odd parts.....	1 1,137,500.00	.....	Soon as possible...	Feb. 18, 1918	.....	19
Apr. 24, 1918	20038A2		.....do.....	6	Spare parts for De Havilland 4's.	.....	.....	.....do.....	.....	.....	.....
Apr. 30, 1918	20038A3		.....do.....	250	Propellers.....	1 22,400.00 1 27,500.00	.....	Completed by May 1, 1918.	.....	.....	.....
			INDIANAPOLIS.								
			PLANES.								
Sept. 15, 1917	7449		Nordyke-Marmon..	{ 1,000 3,000	A7A.....	21,000,150.00	.....	January, 1918.....	{ Nov. 14, 1917 No delivery..	1,000	100
			SPARE PARTS.		U. S. 12 Liberty.....	.....	.....	.....	.....	.....	.....
Apr. 2, 1918	7449-2		Nordyke-Marmon..	3,000	Spare parts for U. S. 12 Liberty.	3,000,000.00	.....	Soon as possible...	.....	.....	.....

* Same order planes.

* Including spare parts.

1 Estimated.

AIRCRAFT PRODUCTION.

Date.	Order No.	Contractor.	Quantity.	Description.	Unit price.	Total value.		Scheduled date for beginning delivery.	Date delivery commenced.	Number delivered to May 25, 1918.	Per cent completed as of May 25, 1918.
						Cost plus.	Fixed price.				
Apr. 13, 1918	20338	CLEVELAND. PLANES. Ohio Rubber Co.		Strand shock absorber for 500 Handley Paige.	1 \$0.48		\$48,000.00	May 1, 1918.	No delivery.		
		SPARE PARTS.									
Oct. 8, 1917	20068	Rubay Co.	300	Spare parts for JN4D.	Various.		233,047.50	January, 1918.	Feb. 15, 1918		71
Nov. 24, 1917	20166A	do.	300	do.	Various.		274,542.00	Soon as possible.	Feb. 20, 1918		85
Oct. 17, 1917	20136	do.	345	Odd spare parts.	Various.		30,015.00	Prior to Apr. 1, 1918.	Feb. 23, 1918		70
Oct. 31, 1917	20180	do.	195	do.	Various.		16,612.50	do.	Dec. 31, 1917		77
Dec. 28, 1917	20386	do.	200	Spare parts for JN4D.	Various.		173,728.00	do.	Not given.		51
Jan. 19, 1918	20398	do.	200	Spare parts for JN4H.	Various.		164,128.00	Soon as possible.	do.		88
Feb. 2, 1918	20422	do.	500	Spare parts for D. H. 4's		\$2,415,000.00		do.	No delivery.		
Feb. 19, 1918	20656	do.	2,000	Odd parts for JN4D.	2 25		5,500.00	do.	do.		
Aug. 23, 1917	9651	Ackerman Wire Wheel Corporation.	1,000	do.	55.00		55,000.00	Sept. 5, 1917.			
Dec. 13, 1917	20324	do.	36	do.	250.00		9,000.00	Soon as possible.			
Dec. 24, 1917	20382	do.	50	Odd parts for JN4H.	250.00		12,500.00	do.		50	100

* Estimated.

1 Per yard.

۱۹

Stanford University Libraries



3 6105 119 536 295

